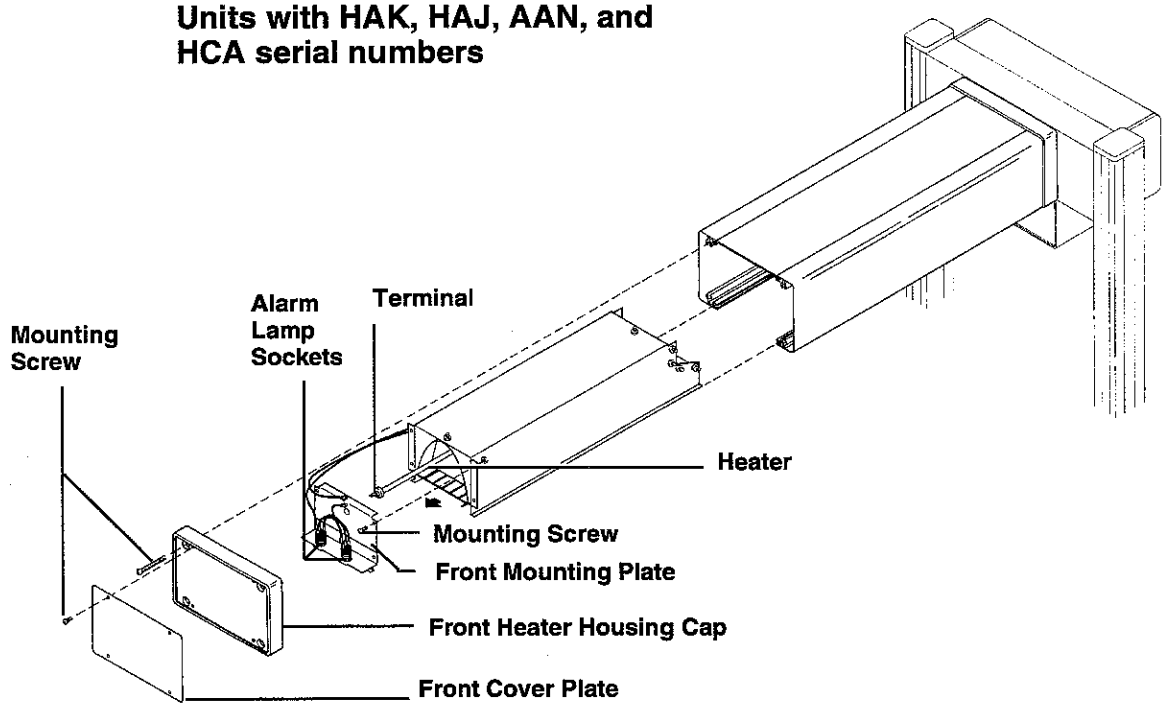
Units with HAK, HAJ, AAN, and HCA serial numbers



Units with HCC serial number

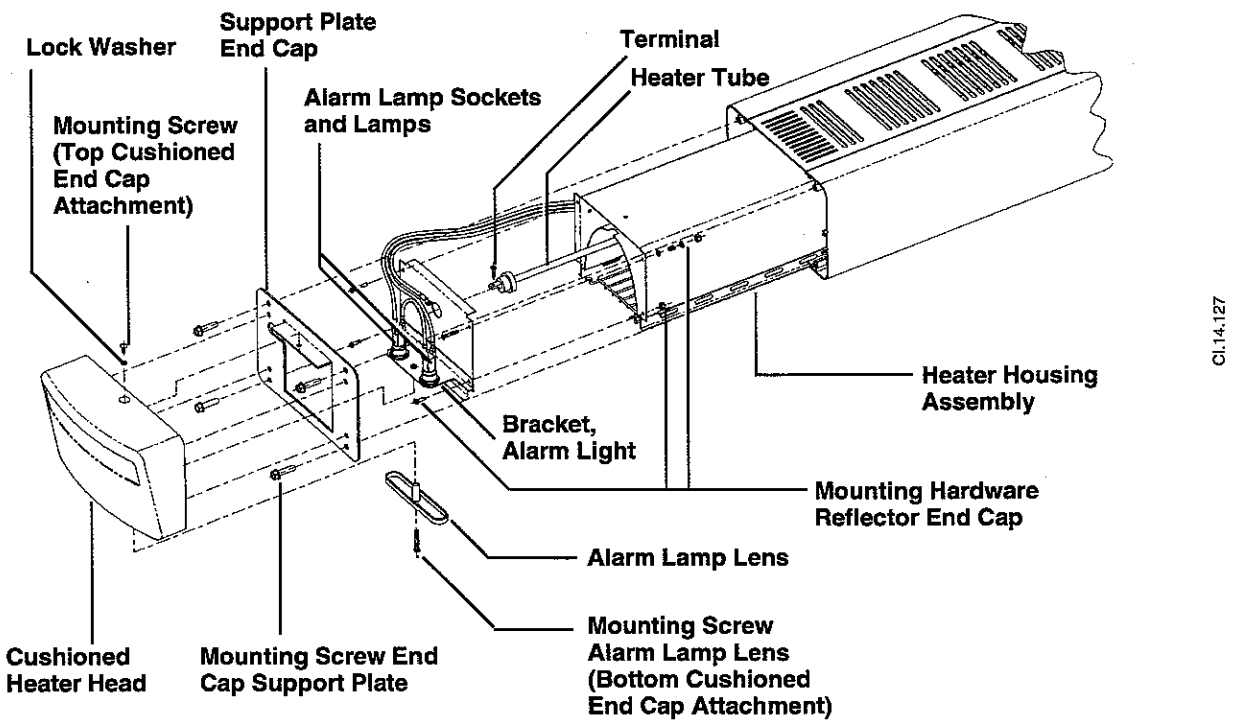


Figure 5-2
Heater Housing Assembly

B. Heater Replacement

(See Figure 5-2)

WARNING ⚠ **Disconnect the power to the warmer and allow the heat tube to cool before cleaning or replacement to avoid the possibility of a burn.**

CAUTION ⚠ During heater rod removal or replacement, hold terminal to ensure no strain is placed on the element.

1. Hold each terminal on the heater rod to ensure no strain is placed on the element while removing the heater wire connection screws from both ends of the heater.
2. Remove the four mounting bolts for the front mounting plate and move it to the side.
3. Slide the heater rod out from the front of the heater assembly.
4. Slide the replacement heater rod in from the front of the heater assembly.

WARNING ⚠ **The replacement heater tube must match your unit. Earlier units have 440 Watt Heaters. Newer units, with serial number beginning with HCA and HCC, have a 540 Watt heater. Installing the new 540 Watt heater tubes in the older units with HAK,HAJ and AAN serial numbers may shorten the life of the power supply board. Check the serial number located on the back panel of the display module against the parts listed in 7/Illustrated Parts to verify you have ordered the correct replacement part.**

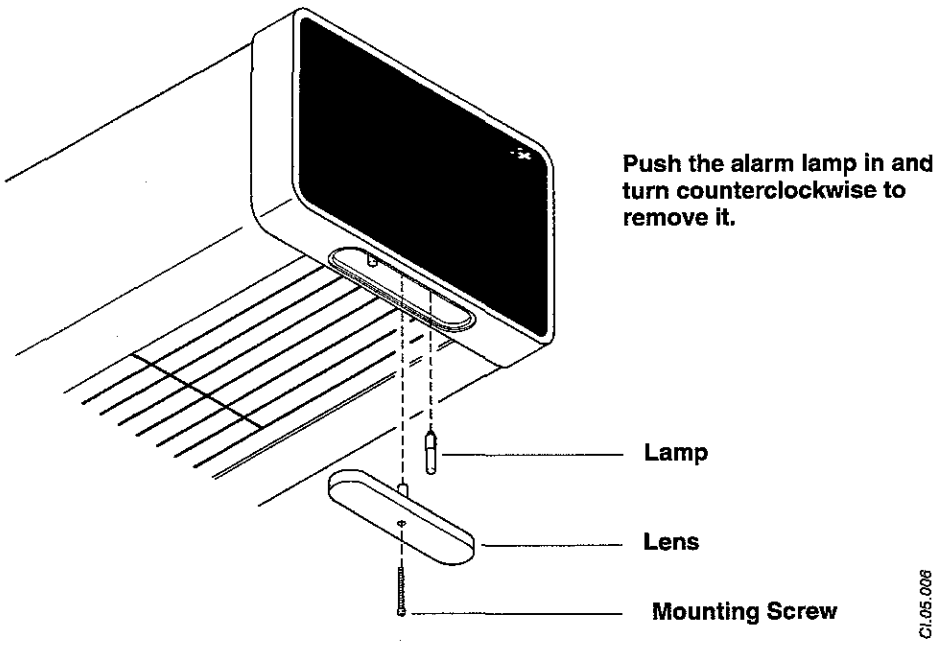
5. Hold each terminal on the heater rod to ensure no strain is placed on the element while replacing the heater wire connection screws on both ends of the heater. Tighten the screws to 12 - 14 lb.-in.
6. Place the front mounting plate in position and replace the four mounting bolts.

C. Heater Housing Assembly

(See Figures 5-1 and 5-2)

1. To reassemble, reverse step 1 through 8 in section 5.1.A, Heater Housing Disassembly.

Units with HAJ, HAK, AAN, and HCA serial numbers



Units with HCC serial Number

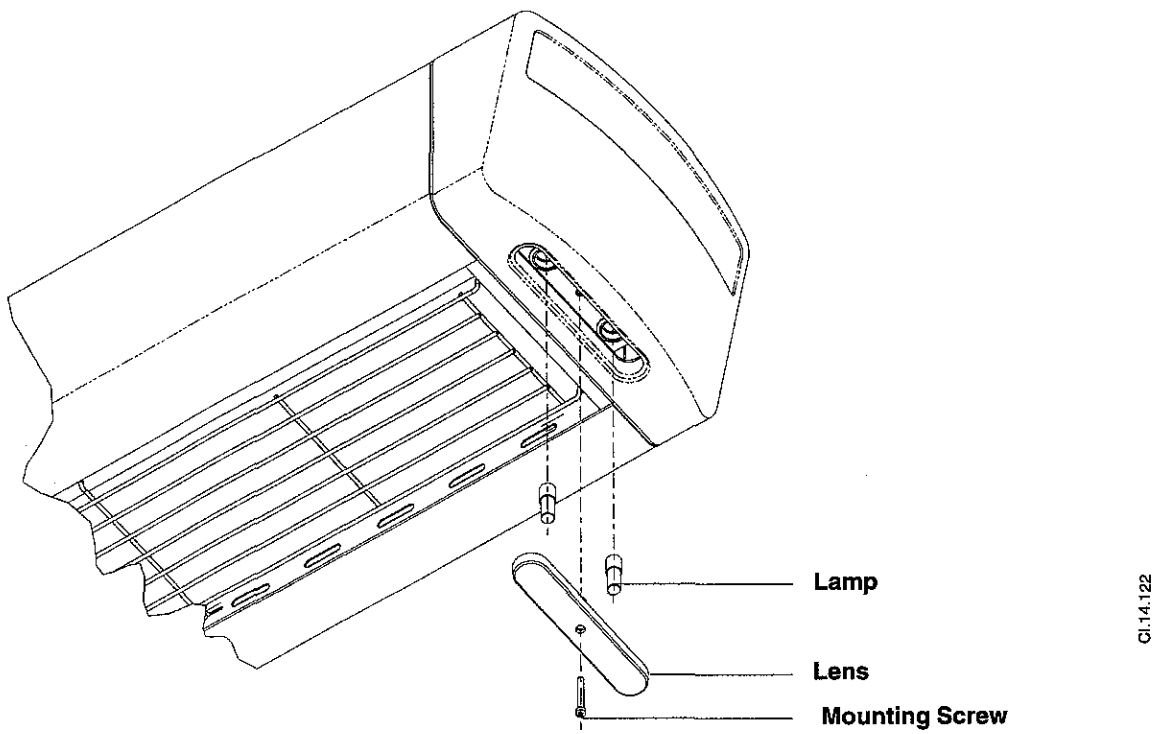


Figure 5-3
Alarm Light Replacement

2. Perform the electrical safety procedures in Section 4 and all the checkout procedures in Section 2.2.

D. Alarm Lamp Replacement

(See Figure 5-3)

Lamp: GTE Sylvania 120MB 6W

WARNING ⚠ **Disconnect the Infant Warmer System power cord and allow the unit to cool before replacing the alarm light.**

1. Disconnect the Infant Warmer System power cord and allow the unit to cool for 10 minutes.
2. Use a Phillips head screwdriver and remove the lens mounting screw located in the center of the alarm light.
3. Remove the lamp by pushing in and turning it counterclockwise.
4. Install the new lamp by pushing in and turning it clockwise.

   Note: When one lamp burns out it is recommended to replace both lamps. Replacing both lamps ensures maximum reliability.
5. Place the lens cover in position and secure it with the mounting screw.
6. Plug the power cord in and perform the checkout procedures detailed in Section 2.2.

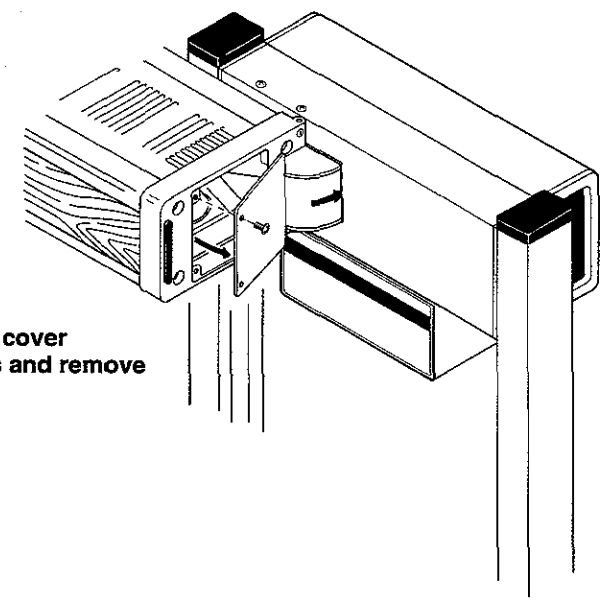


Figure 5-4
Observation Lamp Cover Removal

E. Observation Lamp Replacement

(See Figures 5-4 and 5-5)

Lamp: GE EXZ (Q50 MR16/NFL)

GE EXN (Q50 MR16/FL)

WARNING ⚠ **Disconnect the Infant Warmer System power cord and allow the unit to cool before replacing the observation light. The lamp normally operates at a high temperature.**

Note: Do not touch the center glass bulb. This will reduce the life of the lamp.

1. Disconnect the power cord for the warmer and allow the unit to cool for 10 minutes.
2. Rotate the heater assembly to the X-ray (side) position.
3. Use a Phillips head screwdriver to remove the two back panel mounting screws and remove the back panel (some older units have three screws).
4. While holding the lamp with one hand, use the other hand to pull the lever (next to the lamp) forward and remove the lamp.
5. Place the new lamp in position and push it into the lamp socket.
6. Replace the back panel and mounting screws.
7. Rotate the heater assembly back to the normal operating position.
8. Plug the power cord in and perform the checkout procedure detailed in Section 2.2.

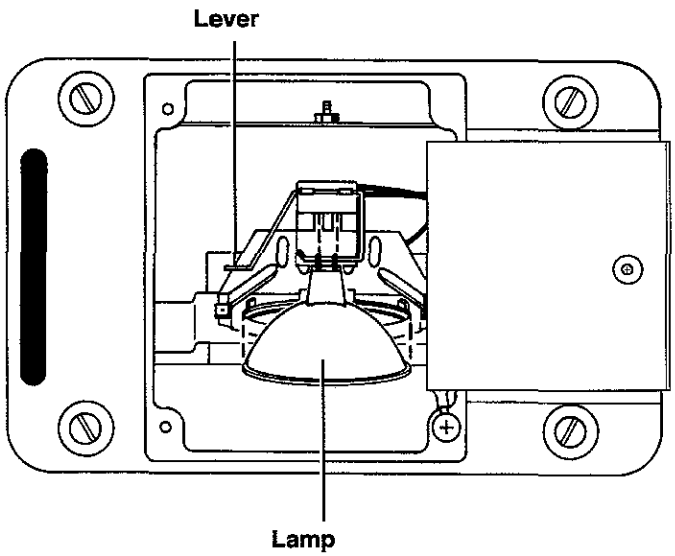


Figure 5-5
Observation Lamp Replacement

5.2 Control Module Repairs

A. Control Module Removal

(See Figure 5-6)

1. Disconnect the Infant Warmer System power cord.
2. Remove the two center mounting screws from the bottom of the display module.
3. Remove the two mounting screws for the control unit cover and remove the cover. Fold the ESD shield (if present) down away from the control board.
4. On models with HAK, HAJ and AAN serial numbers, disconnect the two connectors, J17 and the three pin connector for the observation light to the right of the power board (on elevating models, J16 must also be disconnected). Squeeze the locking tabs on the back of the plug to disengage the locking mechanism.

   On models with the HCA and HCC serial number, disconnect three connectors: the one that connects the heater wire harness (W2, P3) to the power supply board (A1, J17); the one that connects the heater wire harness (W2, P4) to the transformer (W1, J4); and the one that connects the heater wire harness (W2, P2) to the solid state relay (W3, P2). On elevating models, connector W8, P2 must also be disconnected.

   On elevating models with foot switches, disconnect the footswitch upright cable (W13, P1) from the controller footswitch cable (W12, J1).

   Refer to the wiring diagrams in Section 8 to check proper connections.
5. Loosen the four corner mounting screws for the control unit and carefully remove the control module. Place the control unit on a flat surface so it rests on the transformers.

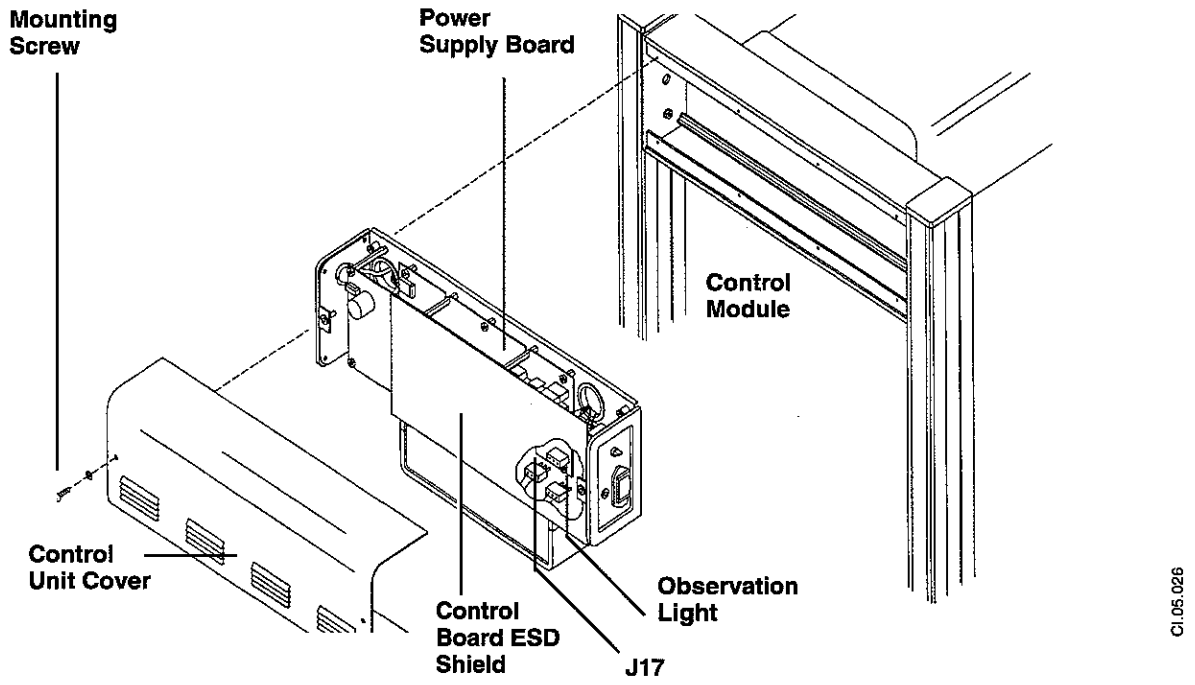


Figure 5-6
Control Module Assembly

B. Control, Power Supply and ThermaLink Board Replacement

(See Figure 5-7)

CAUTION

⚠ When removing cables, always grasp the connector on the sides and gently remove the cable connector from the board. This will prevent weakening of the cable assembly. Never remove the connector by pulling on the cable.

Control Board Removal

1. Disconnect the power cord.
2. Disconnect the four connectors (J1, J5, J6, and J7) from the control board. Disengage the locking tab on the connector by inserting a small screwdriver between the tab and the rear of the connector plug. Grasp the sides of the connector and gently remove the connector plug from the controller board.
3. If the ThermaLink option is installed, disconnect connector J9. Grasp the sides of the connector and gently remove the connector plug from the controller board.
4. Use a 5/16 inch socket to remove the six mounting nuts and three flat washers, if present, for the control board.
5. Remove the control board.

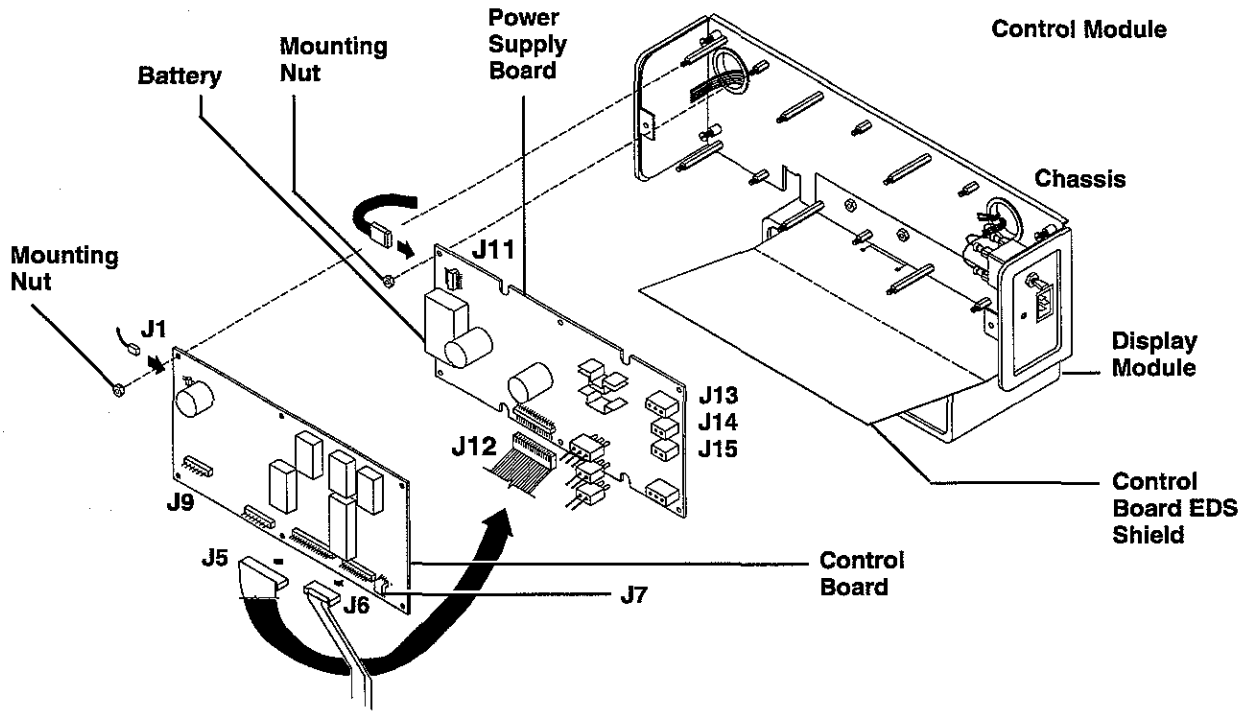


Figure 5-7
Control Board and Power Supply Board Assembly

Power Supply Board Removal

Note: Remove the Control Board first.

1. Disconnect connectors J11 and J12 from the power supply board. Disengage the locking tab on the connector by inserting a small screwdriver between the tab and the rear of the connector plug. Grasp the sides of the connector and gently remove the connector from the power supply board.

2. Disconnect connectors J13, J14, J15, and J17 (also disconnect J16 on elevating models) from the power supply board. Squeeze the locking tabs on the rear of each connector plug to disengage the lock mechanism.

3. Use a 5/16 inch socket to remove the six mounting nuts for the power supply board.

4. Remove the power supply board.

ThermaLink Board Removal

Note: There are two versions of the ThermaLink board. The older version has a test switch (SW1) on the board and is held in place by four screws. The newer version has no test switch and is held in place by two screws.

1. Remove the two mounting screws from the ThermaLink cover. Slide the ThermaLink cover back away from the chassis. Disconnect the ThermaLink external connector cable attached to the cover from connector J31on old version or JP1 on new version of the ThermaLink board. Grasp the sides of the connector and gently remove the connector plug from the ThermaLink board. Remove the cover and set aside.

2. Disconnect connector J9 from the control board. Grasp the sides of the connector and gently remove the connector plug from the controller board.

3. Loosen the four ThermaLink chassis mounting screws from the left hand side of the controller chassis and remove the ThermaLink chassis from the controller taking care not to damage the ThermaLink to control board ribbon cable. On some units, it may be necessary to completely remove the ThermaLink chassis mounting screws prior to removing the ThermaLink chassis from the controller.

4. Disconnect ribbon cable connector from J30 on old version or JP2 on new version of the ThermaLink board. Grasp the sides of the connector and gently remove the connector plug from the controller board.

5. Remove the ThermaLink board mounting screws using a Phillips screw driver and remove the ThermaLink board.

ThermaLink Board Installation

1. Place the new ThermaLink board in position on the four ThermaLink chassis mounting posts.

2. Replace the mounting screws for the ThermaLink board.

3. Reconnect ribbon cable connector J30 on the old version or JP2 on the new version of the ThermaLink board.

4. Place the assembled ThermaLink chassis in position against the left side of the controller chassis taking care not to pinch the ribbon cable, and tighten the four mounting screws. On some older units, it may be necessary to remove the mounting screws and thread them through the holes in the controller chassis.

5. Reconnect ribbon cable connector J9 to the control board.

6. Reconnect the external ThermaLink cable, attached to the ThermaLink cover, to connector J31 on the old version or JP1 on the new version of the ThermaLink board.

7. Place the ThermaLink cover in position and replace the two mounting screws.

8. Perform the electrical safety and the calibration procedures in Section 4. Perform the checkout procedures detailed in Section 2.2.

Power Supply Board Installation

1. Place the new power supply board in position on the six mounting posts.

2. Replace the six mounting nuts for the power supply board.

3. Reconnect connectors J11, J12, J13, J14, J15, J16 (applicable to elevating models) and J17 to the power supply board.

Control Board Installation

1. Place the control board in position on the six mounting posts.

2. Replace the six mounting nuts and three flat washers, if present, for the control board. See figure 5-7.

3. Reconnect the four connectors (J1, J5, J6, and J7) to the control board.

4. If the ThermaLink Option is installed, reconnect the J9 connector to the control board.

5. Perform the electrical safety and the calibration procedures in Section 4. Perform the checkout procedures detailed in Section 2.2.

C. Display Module Disassembly

(See Figures 5-8 and 5-9)

CAUTION ⚠ When removing cables, always grasp the connector on the sides and gently remove the cable connector from the board. This will prevent weakening of the cable assembly. Never remove the connector by pulling on the cable.

---

1. Disconnect the power cord.

2. Remove the 4 bottom cover screws from the Display Module.

3. Slide the bottom cover down from the top cover.

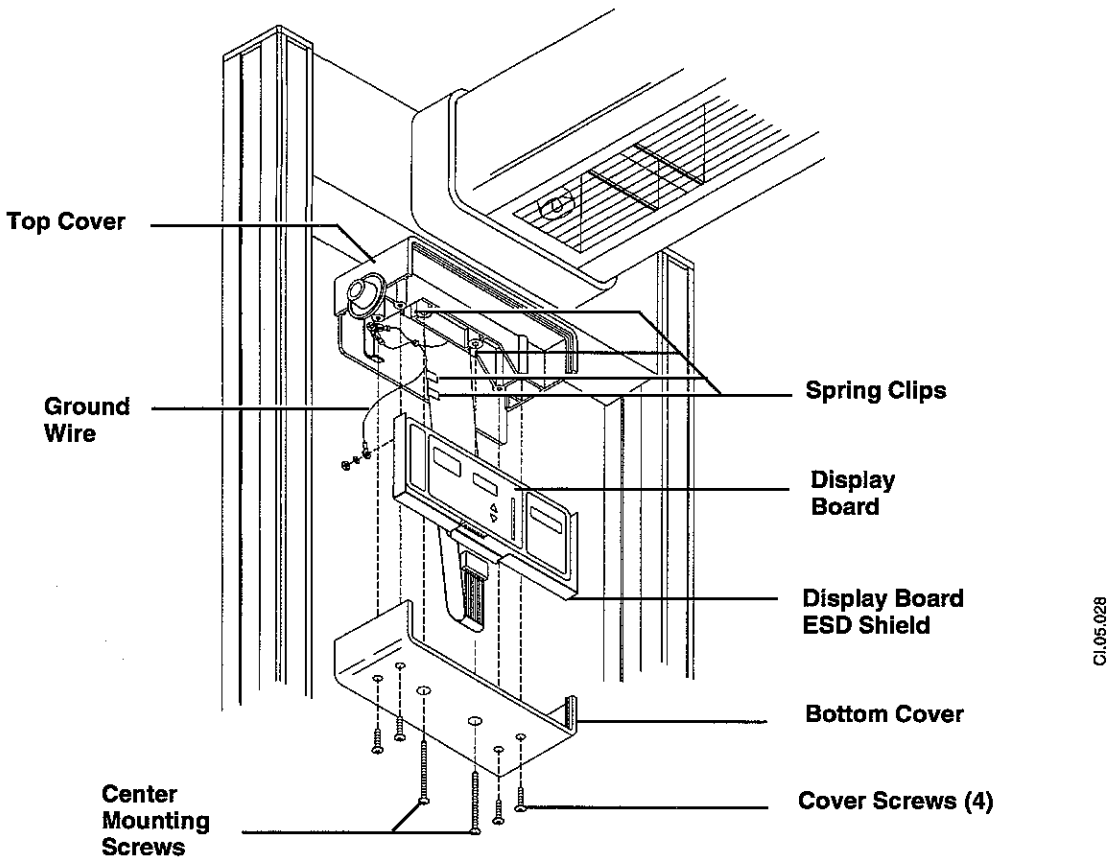
4. Slide the display board out of the cover.

5. Disconnect the ground wires (if present) from the bottom cover by pulling the two fastons off.

6. Remove the 5 mounting nuts from the back of the display board. Remove the flat washers, lock washers, and the ground wire (if present). See Figure 5-9.

7. Remove the ESD shield (if present) and ten flat washers (if present) from the mounting posts. Separate the display board from the display panel.

8. Disconnect the 12 pin connector (J22) from the display board taking care not to damage the ESD shield. Disengage the locking tab on the connector by inserting a small screwdriver between the tab and the rear of the connector plug. Grasp the sides of the connector and gently remove the connector from the display board. On elevating units with HCC serial number, disconnect the controller footswitch cable from the display panel (W12, P1).



Note: ESD shield and spring clips not present on all units.

Figure 5-8
Display Module Assembly

D. Display Module Assembly

(See Figures 5-8 and 5-9)

1. Place the display board on the display panel mounting posts.

2. For units with the ESD shield present, place the 10 flat washers over the threads of the mounting posts, then replace the ESD shield.

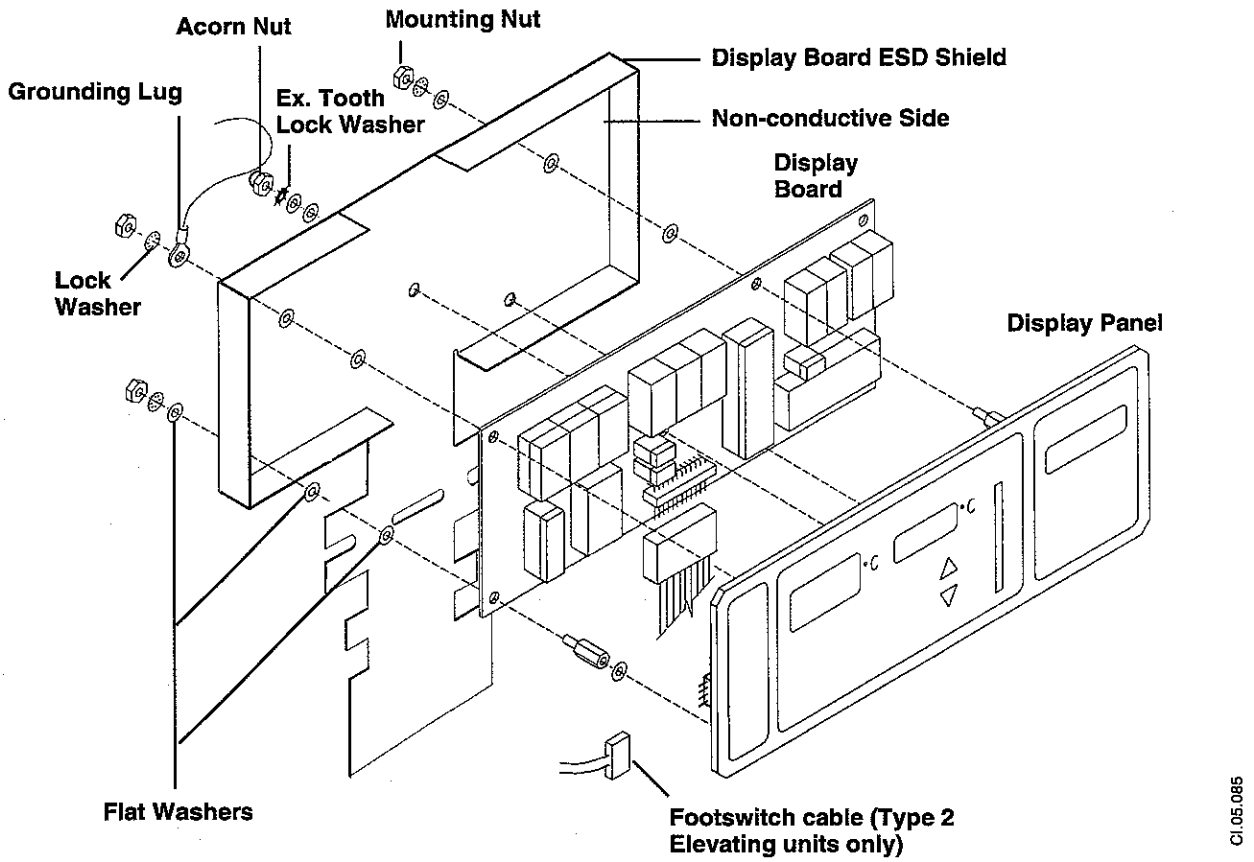


Figure 5-9
Display Board Assembly

3. For units with the ESD shield present, replace the 3 flat washers, 3 lock washers and mounting nuts on all the standoffs except the grounding post and the center stand-off.

4. For units without the ESD shield present, replace the 4 lock washers and mounting nuts on all the standoffs except the grounding post.

5. Replace the ground wire (if present), internal tooth lock washer and mounting nut on the grounding post.

6. For units with the ESD shield present, replace the two flat washers, external tooth lock washer and acorn nut on the center stand-off On HCC elevating units, reconnect the controller footswitch cable to the display panel.

7. Connect the 12 pin connector J22 from the control board to the display board. Ensure that the locking tabs are engaged.

8. Slide the display board into the top cover.

9. Connect the ground wires (if present) to the back cover plate.

10. For units with the ESD shield present, check that all 4 spring clips are in place and holding the foil covered ribbon cable securely to the ESD shield. See figure 5-10.

11. Slide the bottom cover and back panel into the top cover. Be sure that the display and back panel are aligned in the slots, and that you push up evenly on all four corners of the display module.

12. Replace the 4 bottom cover mounting screws for the display panel.

13. Perform the electrical safety and the calibration procedures in Section 4. Perform the checkout procedures detailed in Section 2.2.

E. Control Module Replacement

(See Figure 5-6)

1. Carefully place the control module in position and tighten the four mounting screws for the control unit.

2. Reconnect the two connectors, J17 and the three pin chassis connector to the right of the power board (on elevating models, J16 must also be connected), to the power supply board. On IWS model 5000 and newer models with Serial Numbers starting with HCA and HCC, reconnect J14 to the solid state relay. If present, reconnect cable W3, P2 connecting the solid state relay to the heater wire harness (ref. Wiring diagram in Section 8 of Service Manual).

3. Hold the display module in position and replace the two inside mounting screws on the bottom of the module.

4. For units with the ESD shield present, fold the ESD shield back up into place.

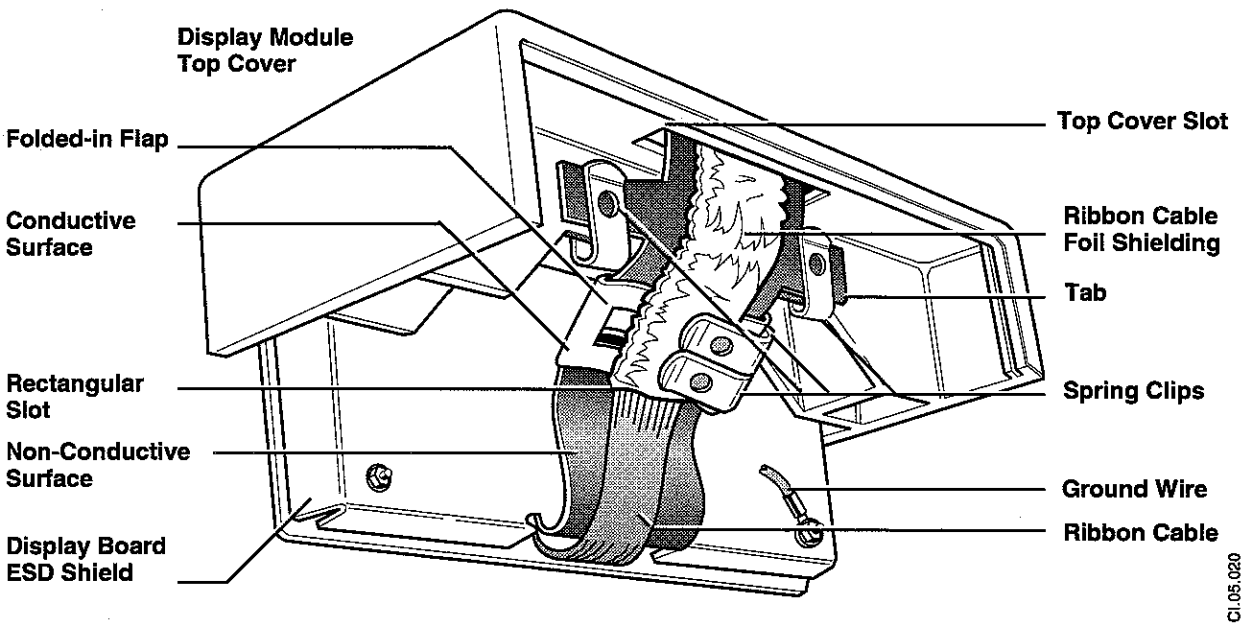


Figure 5-10
Ribbon Cable Grounding Diagram

5. Place the control unit cover in position and replace the two mounting screws.

6. Perform the electrical safety and the calibration procedures in Section 4. Perform the checkout procedures detailed in Section 2.2.

F. Battery Replacement

(See Figures 5-6 and 5-7)

The maintenance free battery should be tested regularly and the replacement schedule is every two years. Refer to Section 2.2B for testing the battery.

1. Disconnect the warmer power cord.

2. Remove the two mounting screws for the control unit cover and remove the cover. For units with the ESD shield present, fold the ESD shield down away from the control board.

3. Disconnect connector J1 from the control board. Disengage the locking tab on the socket by inserting a small screwdriver between the tab and the rear of the plug. You do not have to remove any other connectors.

4. Remove the 6 mounting nuts and 3 flat washers (if present) for the control board.

5. Slide the control board off the mounting posts and rotate it down.

6. Remove the battery and install a replacement battery. Ensure the positive and negative terminals are correctly engaged.

CAUTION: ⚠ Replace only with Ohmeda 7.2 V NI-CAD rechargeable battery.

7. Place the control board in position on the mounting posts.

8. Replace the 6 mounting nuts and 3 flat washers (if present) for the control board.

9. Reconnect connector J1 to the control board.

10. For units with the ESD shield present, fold the ESD shield back up into place.

11. Replace the two mounting screws for the control unit cover.

12. Perform the electrical safety procedures in Section 4 and the checkout procedures in Section 2.2.

G. Circuit Breaker Reset

The warmer is equipped with a combination power switch and manual resetting circuit breaker. If the circuit breaker trips the power switch is deactivated. To reset the circuit breaker return the switch to the "On" position. If the circuit breaker trips again, service is required.

5.3 Bed Platform Repairs Small and Large Bed Models (For Model 3500 see section 5.4)

A. Side Panel Replacement

(See Figure 5-11)

To remove a side panel, first lower the side panel then press the end pins in and lift the side panel out. To replace a side panel, hold the end pins in, place the side panel in position, and release the end pins. To lower the side panel, pull up and rotate away from the bed. To raise the side panel rotate it to the upright position, then allow it to engage in the latched position.

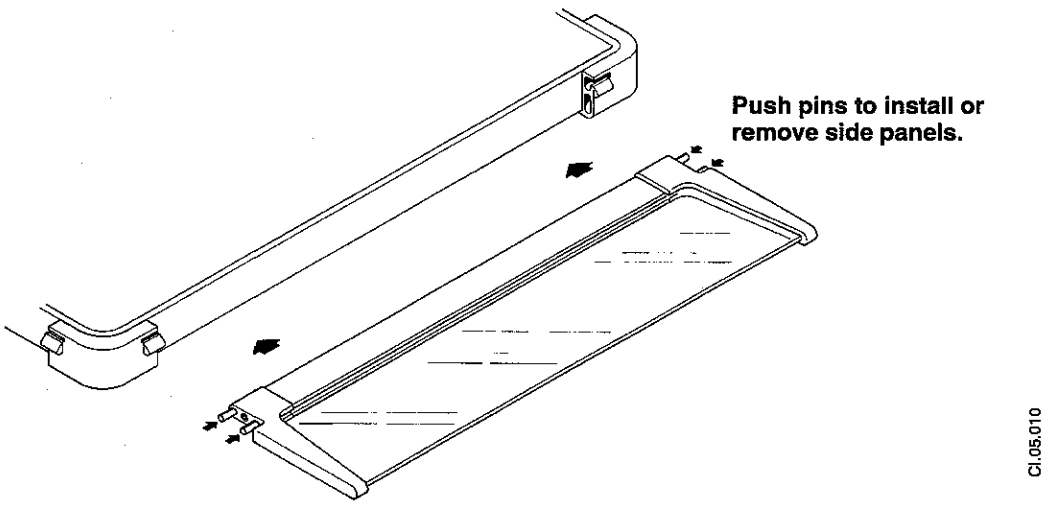


Figure 5-11
Side Panel Replacement

B. Side Panel Repairs

(See Figure 5-12)

Disassembly:

1. Remove the mounting screw from the end bracket.
2. Disassemble the end bracket, window, support button and spring from the bed side. You may need to heat the Loctite slightly to disassemble the end bracket.
3. Replace damaged parts as necessary.

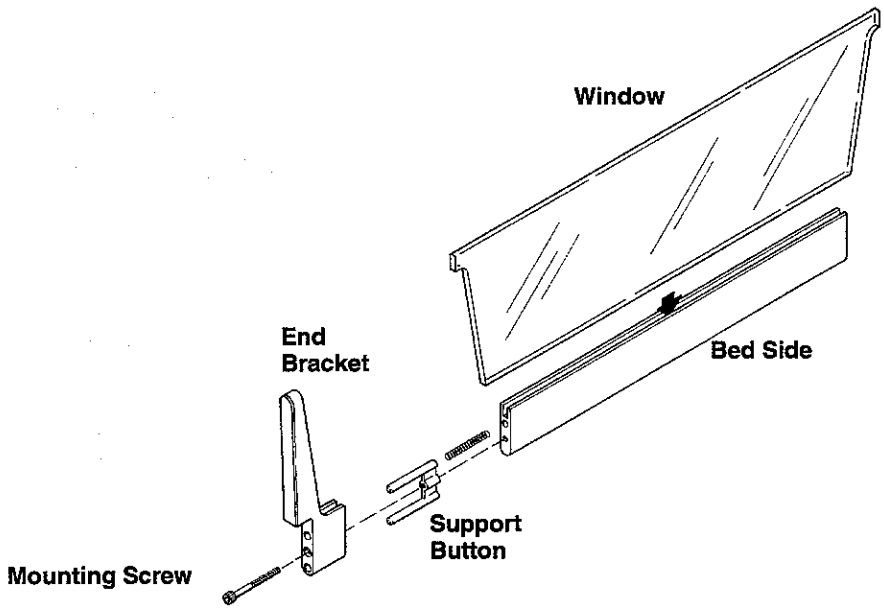


Figure 5-12
Side Panel Assembly

Assembly:

1. Mount the spring, support button, and end bracket on the bed side and window.
2. Replace the mounting screw and tighten securely.

C. Bed Platform Disassembly

(See Figure 5-13)

1. Remove the mattress and the clear plastic cover.
2. Remove the four side panels from the bed platform.

Note: Before removing the hydraulic cylinder on units with rotating drawer packages, the drawer package must first be removed. On units with the stationary drawer package installed, the top drawer must be removed for access to the hydraulic system mounting kit. See appendix.

3. Use a 1/2 inch wrench and 7/16 inch wrench to remove the hydraulic system mounting nut and stud from the lower support.
4. Use a No. 2 Phillips screw driver and remove the four retaining rods and hooks from the bottom of the bed platform.
5. Slide the two bed pivot rods out from each side.
6. Lift the bed platform off the lower support.

D. Bed Platform Assembly

(See Figure 5-13)

1. Place the bed platform in position on the lower support.
2. Insert the two bed pivot rods into position on the lower support. The notch must face the bed platform (upwards), and be positioned between the notches in the bed platform.
3. Use a No. 2 Phillips screw driver and install the four retaining rods and hooks (if present) on the bottom of the bed platform. The open end of the hooks should face away from the bed platform.
4. Use a 1/2 inch wrench and 7/16 inch wrench to install the hydraulic system mounting nut and stud on the lower support.

Note: Before removing the hydraulic cylinder on units with rotating drawer packages, the drawer package must first be removed. See appendix.

5. Replace the four corner blocks and eight O-rings, if present, on the bed platform.
6. Replace the four side panels on the bed platform.
7. Replace the clear plastic cover.
8. Replace the mattress.
9. Perform checkout procedure in section 2.2.

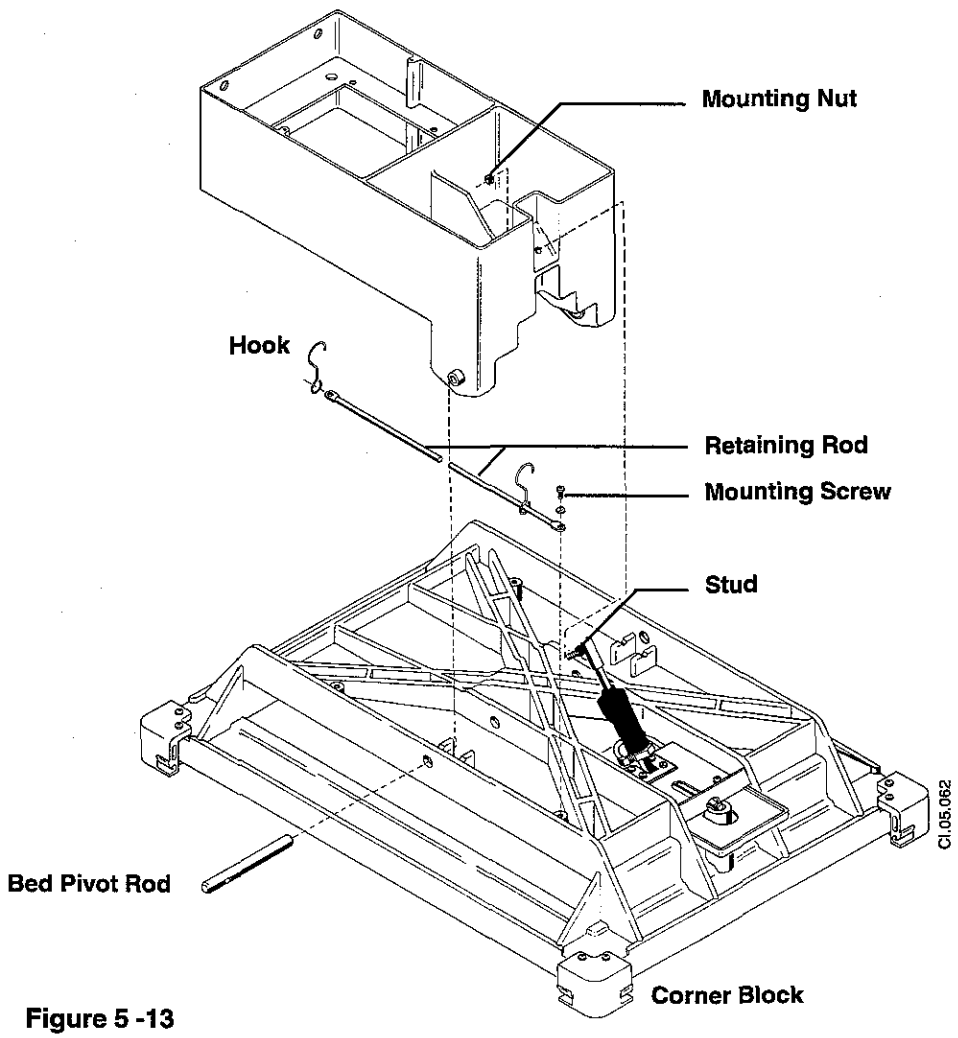


Figure 5 -13
Bed Platform Assembly

E. Hydraulic System Removal

(See Figures 5-14 and 5-15)

Note: Before removing the hydraulic cylinder on units with rotating drawer packages, the drawer package must first be removed. On units with the stationary drawer package installed, the top drawer must be removed for access to the hydraulic system mounting kit. See appendix.

WARNINGS

⚠ **Before any disassembly or repair disconnect the power supply, gas pipeline supply connections, remove any gas cylinders and remove any accessories from the uprights.**

⚠ **When lowering or lifting the Infant Warmer System to and from the floor for inspection or repair, use two people for safety. Always ensure that you lay the unit on its right side (as viewed from the front) when laying the unit down. The heater/ lamp housing does not lock and pivots to the left for access.**

The unit may be carefully placed on it's right side (looking from the front), or the bed may be removed for replacement of the hydraulic system.

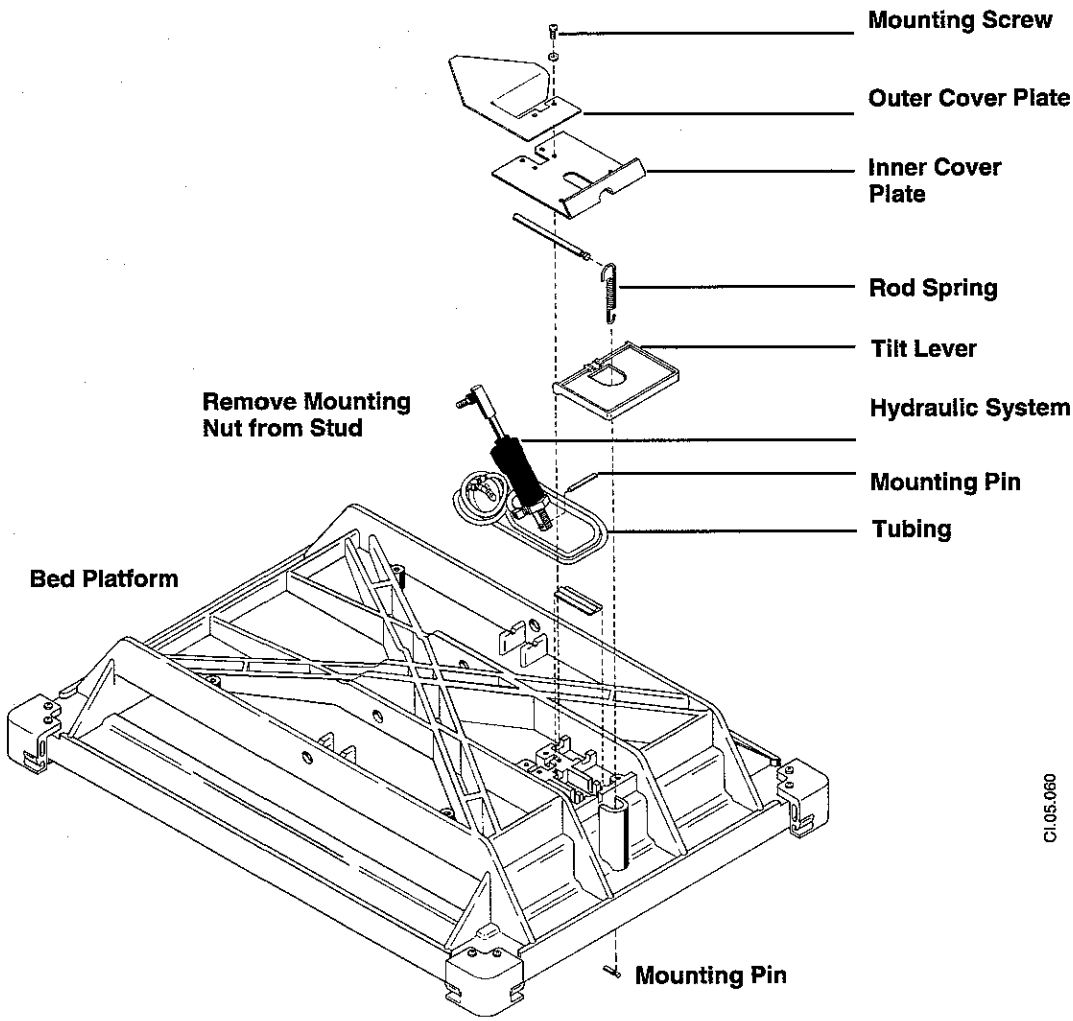


Figure 5-14
Hydraulic System Assembly

1. Use a 1/2 inch wrench and 7/16 inch wrench to remove the hydraulic system mounting nut and stud from the lower support.

2. Remove the two Phillips head mounting screws which hold the outer (triangular shaped) cover plate in position.

3. Remove the four Phillips head mounting screws which hold the inner (square shaped) cover plate in position. Ensure that the tension on the spring is released carefully.

   Note: The tilt lever, rod, spring, and mounting pin can be removed for replacement if necessary. Remove the pin from the top of the bed to remove the spring and rod.

   Note: On large bed models, the outer and inner hydraulic cover plates are combined into a single component.

4. Make note of how the tubing is installed in parallel, and does not overlap until it reaches the storage area.

5. Remove the hydraulic system assembly for replacement.

F. Hydraulic System Installation

(See Figures 5-14 and 5-15)

1. Transfer the mounting pin from the old hydraulic cylinder to the new hydraulic cylinder.

2. Place the hydraulic cylinder with pin in position in the bed support casting.

3. Install the tubing for the hydraulic system in parallel and make sure it does not overlap until it reaches the storage area.

CAUTION

⚠ When servicing the bed hydraulic system, the tubing must not be stretched, pinched or kinked during reassembly. If the tubing is pinched, the bed will not tilt and damage and oil leaks may result.

---

4. On small bed units, place the inner (square shaped) cover plate in position. On Large bed units, place the single cover in position.

5. Install the two mounting screws closest to the tilt lever.

6. Install the two mounting screws closest to the cylinder at the edge of the cover plate.

7. Coil the tubing so it fits in the triangular area.

8. On small bed units, place the outer (triangular shaped) cover plate in position and replace the two Phillips head mounting screws.

9. Use a 1/2 inch wrench and 7/16 inch wrench to tighten the hydraulic system mounting nut and stud in place on the lower support.

Install the tubing for the hydraulic system in parallel and make sure it does not overlap until it reaches the storage area. The tubing must not be stretched, pinched or kinked during reassembly.

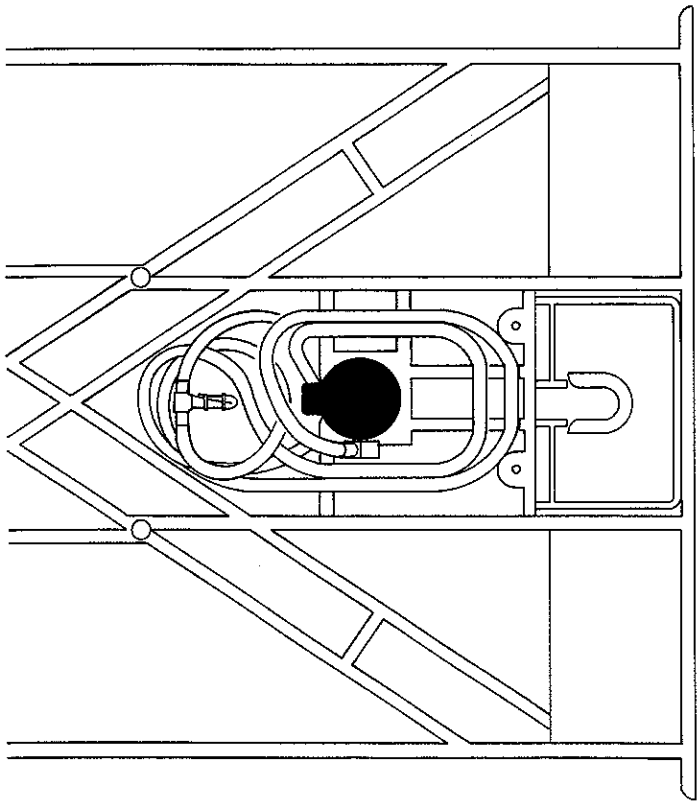


Figure 5-15
Hydraulic Tubing Installation

10. Re-install the rotating drawer package if previously removed.

11. Perform the checkout procedures in section 2.2.

5.4 Model 3500 Bassinet Bed Platform Repairs

A. Side Panel Replacement

(See Figure 5-11)

To remove a side panel, first unlock the ends by sliding the latch buttons outward to expose the red dots. Grasp the side panel, pull up and rotate away from the bed. Press the end pins in and lift the side panel out. To replace a side panel, verify the latch buttons are in the outward position exposing the red dots, hold the pins in, place the side panel in position and release the end pins. Grasp the side panel and rotate it to the upright position allowing it to engage in the latched position. Lock the ends by sliding the latch buttons inward to cover the red dots.

B. Side Panel Repairs

(See Figure 5-11 and 5-12)

Disassembly:

1. Remove the mounting screw from the end bracket.
2. Disassemble the end bracket, windows, support button and spring from the bed side.
3. Replace damaged parts as necessary.

Assembly:

1. Mount the spring, support button, and end bracket on the bed side and window.
2. Replace the mounting screw and tighten securely.
3. Perform the checkout procedures in section 2.2.

C. Bed Platform Disassembly

(See Figure 5-16)

1. Remove the mattress.
2. Remove the four side panels from the bed platform.
3. If necessary, remove the four corner blocks from the bed platform.
4. Using the handle, lower the front of the bed platform and lock in place.
5. Working from the rear of the unit, locate the collar on the left side of the pivot rod. Using a long 1/8" Allen wrench, loosen the set screw in the collar.
6. Grasping the entire bed platform, move it to the left so the shouldered spacers are no longer positioned in the indexing pivot bracket.
7. Pull the handle (forward) to release the indexing pins from the detents, grasp the entire bed platform and lift off the indexing pivot bracket.

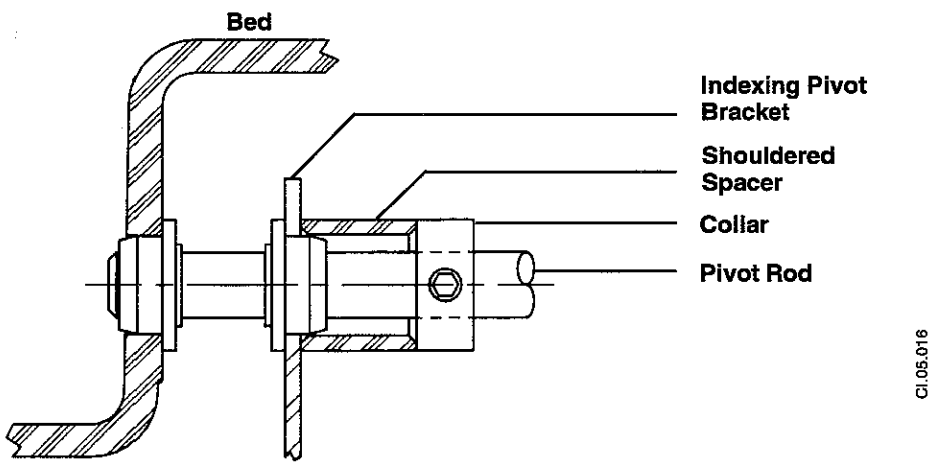


Figure 5-16
Bed Platform Pivot Rod, Spacer and Collar Assembly (Model 3500) as Viewed from the Rear

D. Bed Platform Assembly

(See Figure 5-16)

1. Place the bed platform on the indexing pivot bracket.
2. Pull the handle (forward) and place the indexing pins in the top detents. Release the handle.
3. Work from the rear of the unit. With the pivot rod in the indexing pivot bracket, move the bed platform to the left so the shoulder spacers are positioned in the indexing pivot bracket.
4. Using the handle (forward), lower the front of the bed platform and lock in place.
5. Slide the spacer and collar to the left, so the spacer is against the indexing pivot bracket.
6. Using a long 1/8" Allen wrench, tighten the set screw in the collar.
7. If they were removed, replace the four corner blocks on the bed platform.
8. Replace the four side panels on the bed platform.
9. Replace the mattress.
10. Perform the checkout procedures in section 2.2.

5.5 Model 3500 Bassinet Drawer Removal

The bassinet drawers may be removed from the bassinet cabinet for cleaning.

1. Pull the drawer out to its maximum travel.
2. The drawer slides (located between each drawer side and the cabinet) each have a release latch located on top of the slides. With your finger (or the blunt end of a pencil), reach in between the drawer and the cabinet and press down on the front edge of each latch to release them. Slide the drawer out of the cabinet.
3. To replace a drawer, insert the drawer slides into the cabinet tracks and close the drawer fully. The drawer latches will engage automatically when the drawer is closed.

5.6 Elevating Base Disassembly and Repair

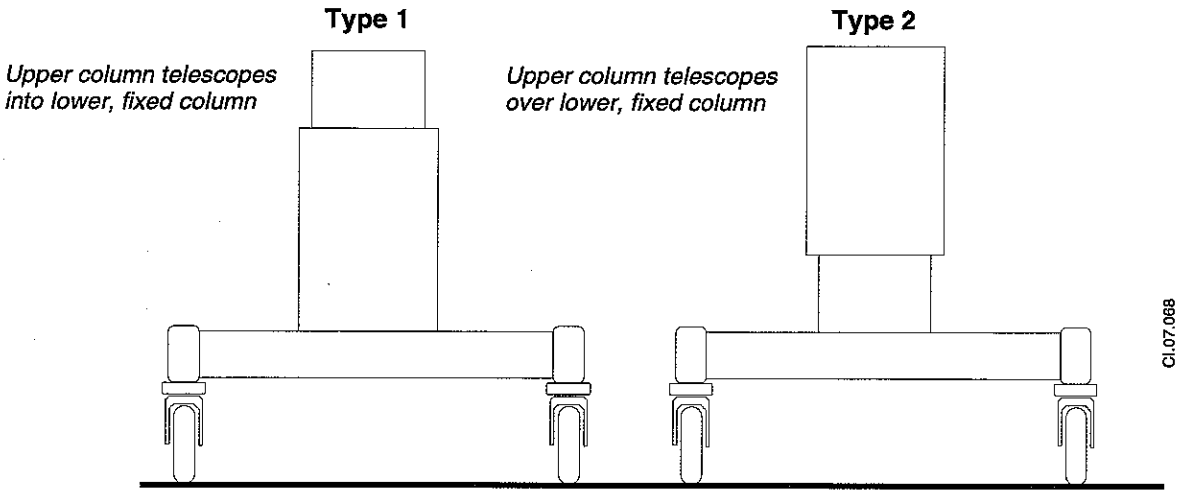


Figure 5-17
Elevating base types

A. Electric Motor/Jack-Shaft Disassembly and Re-assembly.

Type 1 units are shown in Figures 5-18 to 5-22. For Type 2 units, see Figures 7-11 and 7-12.)

WARNING

⚠ **Before any disassembly or repair disconnect the power supply, gas pipeline supply connections, remove any gas cylinders and remove any accessories from the uprights.**

General Disassembly Procedures

Note: This procedure requires two people, since the Infant Warmer is heavy and must be carefully laid on its right-hand side (as viewed from the front of the unit) during the operation. In order to replace the lift motor, phase capacitor, gear box/jack-shaft unit or motor power cable, the following steps are necessary.

WARNING

⚠ **Lowering or lifting the Infant Warmer System to its side requires two people due to the size and weight of the unit.**

⚠ **Whenever the unit must be laid on its side for a repair procedure, lay it on the right side (as viewed from the front), the lamp-house assembly swings freely to the left and attempting to lay the unit on the left side could cause injury to a repair person or damage to the equipment.**

1. Remove accessories from the uprights, the mattress, clear plastic panel, X-ray tray and side panels, as described in Section 5 C.
2. Remove the drawers of the unit.
3. Remove the cover plate from the bed support casting. See item 2, Figure 7-7.
4. Disconnect the motor cord plug and socket located inside the bed support casting. On units with HCC serial number, disconnect footswitch connector.
5. Remove the connector from the motor cord plug, or you can stretch the cord as you remove the baseplate and disconnect it at that end instead.
6. Remove the strain relief clamp around the motor cord and allow the cord to fall down inside the elevator column.
7. On Type 1 units, use a 1/2 inch wrench to remove the upper motor/jack-shaft mounting bolt and lock washer.

   On Type 2 units, use a 5/8 inch wrench to remove the upper motor/jack-shaft by removing the 2 hex nuts that secure it.

   Note: On Type 1 units, there is an external lock washer between the head of the bolt and the upper plate. There is also another lock washer, on the same bolt, under the plate between the top of the jack-shaft and the plate. See Figure 5-19.

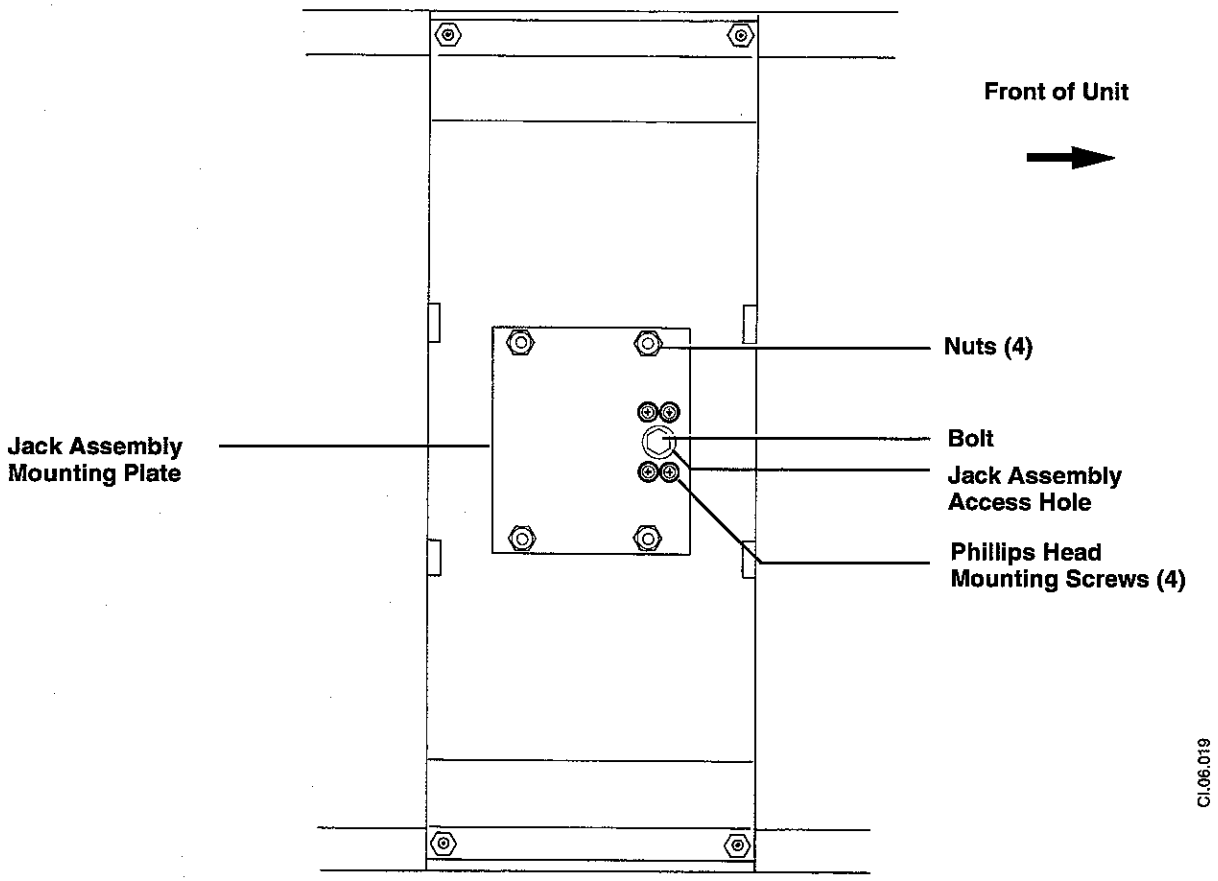


Figure 5-18
Bottom View of 5000 IWS (laying on its right hand side).

8. Carefully lay the warmer on its right-hand side, as viewed from the front.

9. Use a 1/2 inch wrench (or a 9/16 inch wrench on units with HCC serial number) to remove the four (4) 5/16-18 hex nuts and external lock washers from the assembly base plate. DO NOT REMOVE THE FOUR PHILLIPS HEAD SCREWS.

10. Pull out the base plate and the entire elevating assembly carefully; the ground wires and motor phase capacitor are mounted to the base plate.

    Note: The removal of the assembly requires some maneuvering. Gently pull the assembly out and turn it in a clockwise direction until the motor is located in the upper left corner of the access hole. Lifting outward on the bottom of the unit and gently maneuvering back and forth should allow the unit to be pulled out of the elevator column.

WARNING

⚠ **When disassembling the elevating base, observe the following safety precaution to avoid electrical shock hazard from high voltage. Safely discharge the capacitor prior to removing any connectors.**

11. Using an insulated screwdriver, carefully ground the phase capacitor to the base plate to remove any electrical charge and chance of shock.

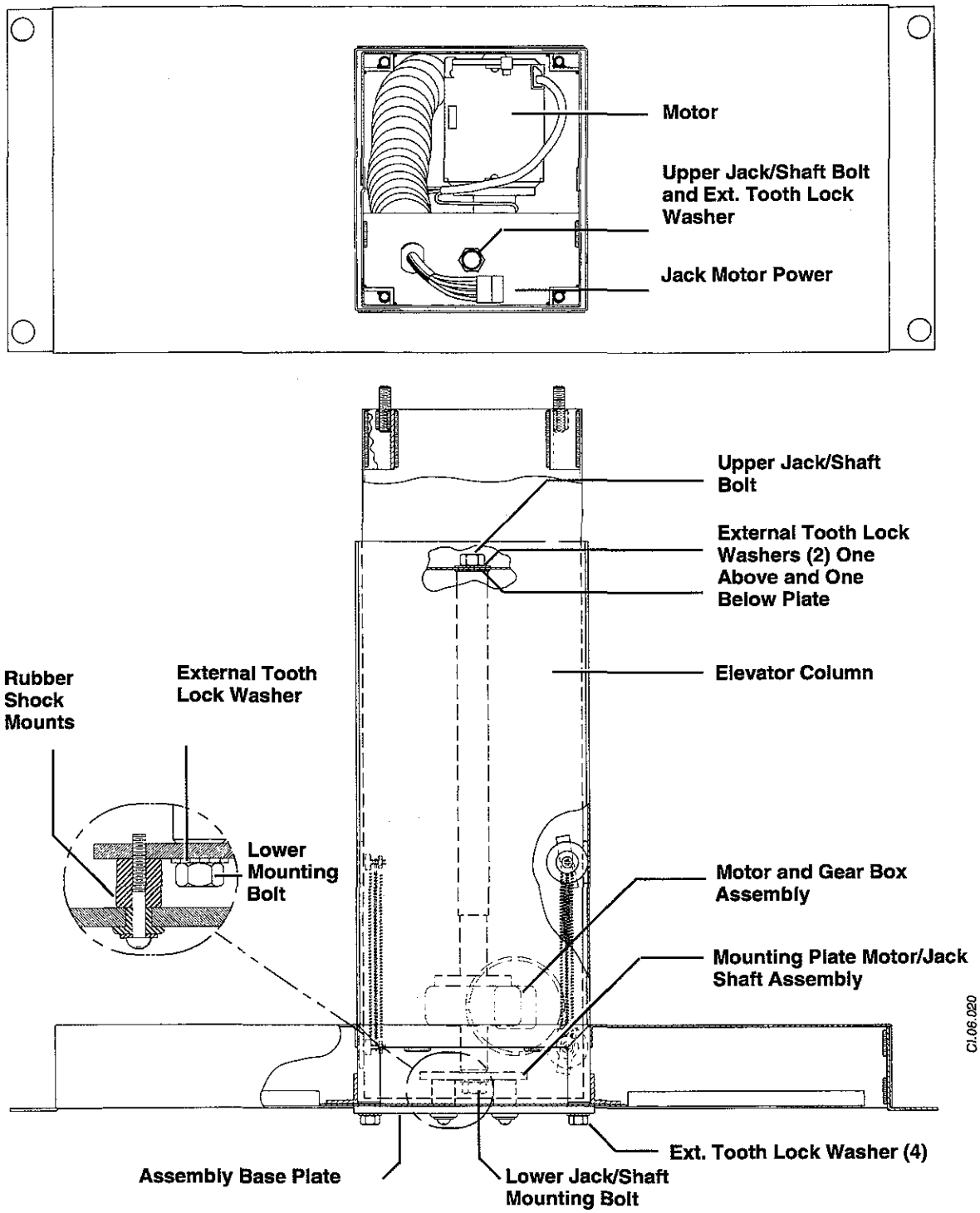

Motor
Upper Jack/Shaft Bolt and Ext. Tooth Lock Washer
Jack Motor Power
Upper Jack/Shaft Bolt
External Tooth Lock Washers (2) One Above and One Below Plate
Elevator Column
Rubber Shock Mounts
External Tooth Lock Washer
Lower Mounting Bolt
Motor and Gear Box Assembly
Mounting Plate Motor/Jack Shaft Assembly
Ext. Tooth Lock Washer (4)
Assembly Base Plate
Lower Jack/Shaft Mounting Bolt
CI.06.020

Figure 5-19
Top and Cut-away Internal Side View of Elevating System, Type 1 unit

12. On type 1 units, when the assembly is clear, check the top of the jack-shaft for the upper lock washer which may have stuck to the shaft. If the washer is there, remove it and set aside. If it is not, reach up the elevator column and remove it from the upper mounting bolt and set it aside.

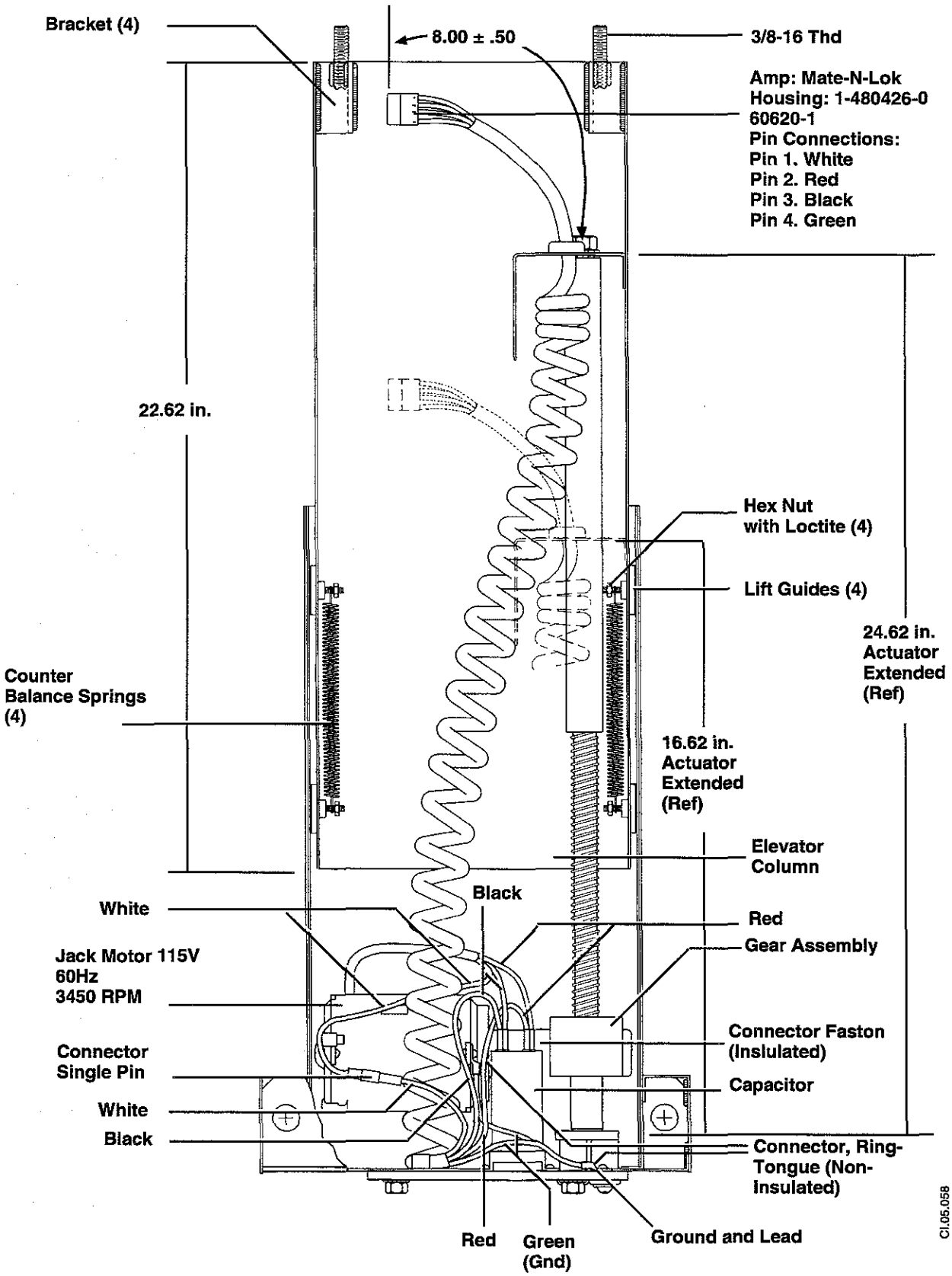


Figure 5-20
Cut-away, Internal Side View; Cable and Wiring Connections - (Type 1 unit shown)

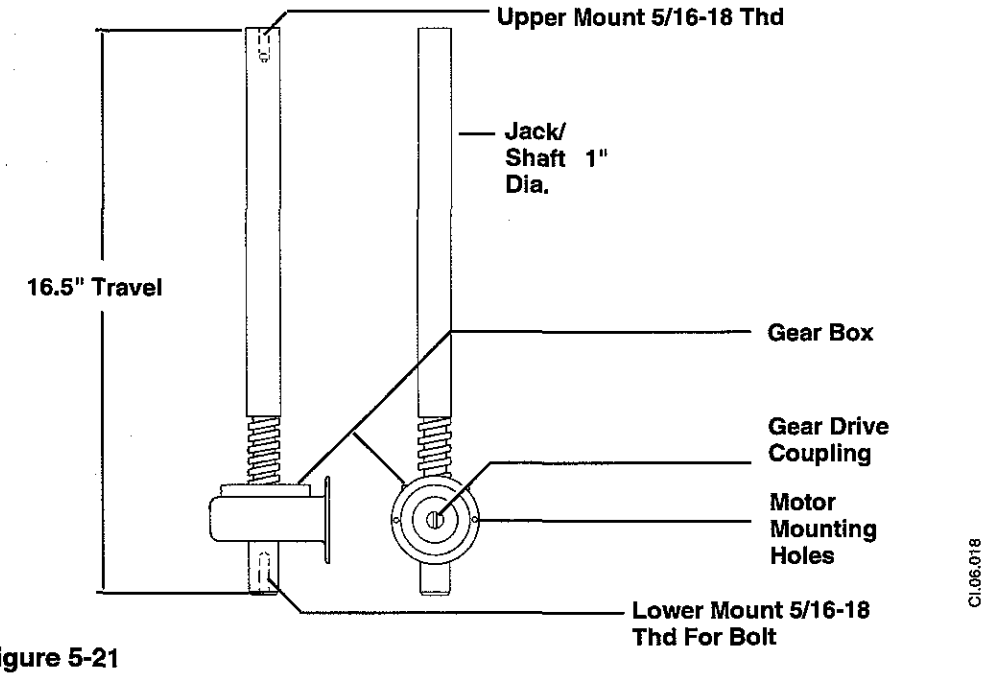


Figure 5-21
Gearbox and Jack-Shaft Assembly.

13. Remove the motor/jack-shaft assembly to replace the motor, motor coupling, phase capacitor, gear box and shaft, or power cable.

14. Re-assemble according to section 5.6 H

B. Motor Replacement

Disassembly

The motor is bidirectional. It has thermal overload protection and there are three (3) power connection wires:

White - Common, connects to the power cord
Red - Clockwise Rotation, connects to capacitor
Black - Counter-Clockwise Rotation, connects to capacitor

1. Use a 3/8 inch wrench to remove the two nuts that hold the motor housing to the gear box assembly. On Type 1 units, one of these nuts holds the ground connection from the motor housing power cable. On Type 2 units, remove the 8-32 hex nut from the base plate ground stud to disconnect the motor ground wire.

2. Lift the motor away from the gear box assembly. The motor shaft is coupled to the gear drive with a hard rubber coupling. Make note of how the coupling is oriented for reassembly—it is slotted for alignment with a gear drive coupling in the recess of the gear box.

Reassembly:

Note: When replacing the motor, you must align the groove in the motor coupling with the drive coupling in the gear box. Ensure that the slot of the motor coupling and the drive coupling are in approximately the same plane. The coupling will settle into final alignment when the jack-shaft is turned. The motor cable should be on the top left when the motor is reassembled to the gear box (as viewed from the rear of the motor).

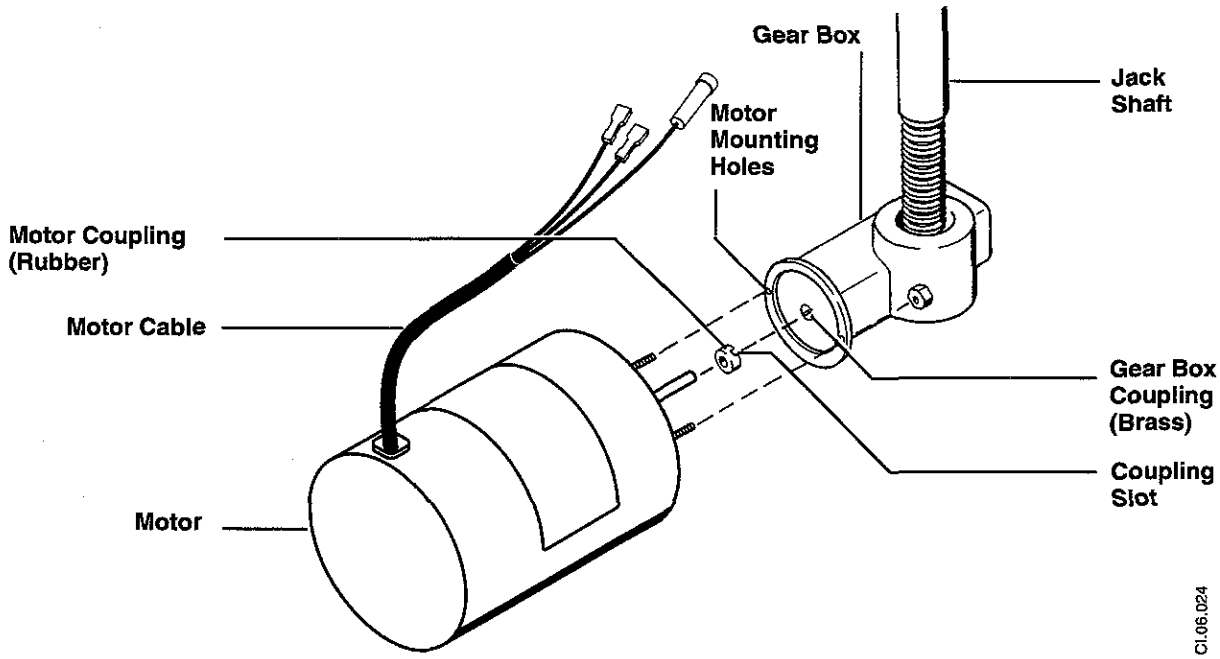


Figure 5-22
Motor and Gearbox Assembly.

1. Slip the motor coupling into the gear box assembly and align the studs of the motor housing with the mounting holes on the gear box.
2. Start the 10-32 nut on the right side (viewed from the shaft end of the motor). Do not tighten.
3. On Type 1 units, replace the ground wire for the motor housing and start the threads of the 10-32 hex nut. Fit the motor housing against the gear box to ensure proper alignment of the coupling.
4. If the motor does not easily fit flush against the gear box, check the coupling alignment.
5. When the motor is properly aligned, tighten the motor mounting nuts.
6. On Type 2 units, re-connect the motor ground lead to the base plate

C. Jack Replacement

The gear box/jack-shaft is a single assembly. The preceding procedures explain disassembly. See Figure 5-22 for gear box/jack-shaft configuration.

D. Capacitor Replacement

WARNING

⚠ **When disassembling the elevating base, observe the following safety precaution to avoid electrical shock hazard from high voltage. Safely discharge the capacitor prior to removing any connectors.**

1. Carefully discharge and then disconnect the capacitor as detailed in the General Disassembly procedure, steps 9, 10 and 11.

2. To remove and replace, disconnect the red and black wire connectors, lift out the old capacitor from the mounting base and slip in the new one. On some models (those with a capacitor with a plastic casing) it may be necessary to install a capacitor mounting bracket first to accommodate the larger size replacement capacitor (with a metal casing). See 7/Illustrated Parts.

3. Reconnect wires. Ensure that connections to the capacitor are power cord red and motor red to the same terminal, power cord black and motor black to the other terminal, see Figure 7-12.

   Note: Failure to observe the preceding step will result in the bed moving in reverse of the panel indicators.

E. Power Cord Replacement

In order to replace the power cord, the jack shaft assembly must be removed as described in 5.6A. The power cord is a special coiled, four-conductor, rubber covered cord. It has a four (4) pin Mate-N-Lok connector on the upper end and red, black, white and green wires on the other end. The white wire has a single pin connector which attaches to the white motor lead with a mating connector. The green (ground) wire is crimped into a ring-tongue lug which also has a short green wire (with a crimp on lug) to provide the motor ground connection.

1. Disconnect all electrical connections.

2. The upper end of the power cord is held in place by a strain relief bushing which must be compressed to remove.

3. The lower end of the power cord is held in place by a cable clamp which is attached to the assembly base plate. The clamp must be removed.

4. The power cord should be free for removal and replacement.

5. In some cases, it may be necessary to replace the strain relief bushing.

F. Column Guide Lubrication on Type 1 units

Anytime service is required on the lift, the column guides should be lubricated.

Note: The elevating base must be completely removed from the warmer and top mounting screw removed from the jack shaft before performing the following procedure.

1. The person positioned at the top of the unit must hold it while the second person at the bottom pulls the lower part of the unit away from the top. The distance between full lowered position and full raised position is eight (8) inches.

2. Use a cotton swab or your finger to apply Lubriplate (6600-0095-300) along each inside corner of the lower column. The column guides ride on this surface.

   Note: The unit moves eight inches from the fully lowered position to the fully raised position. If you pull it apart any further, the unit will separate, and then you must use the following procedure to rejoin the upper and lower columns.

   a. Remove the four (4) hex nuts that secure the lower end of tension springs with a 3/8 inch wrench. See Figure 5-20.

   b. Use long-nose pliers or a spring hook to remove the lower loop of the tension springs.

WARNING ⚠ **Depending on the position of the upper column in relation to the lower column, the springs could be heavily or lightly tension loaded. Use care when releasing the springs.**

c. Push the column guides toward the bottom of the column. The slotted mounting holes will position the guide so the top section of the column will slide in the bottom section.

d. Slide the two sections together ensuring that they are properly aligned. It may take several attempts to slip the lower column section over the top while clearing the guides. When the top column is properly positioned the hole for the screw jack is to the front of the column.

e. After the two units are rejoined, check that they slide without binding.

f. Replace each tension spring by reconnecting the end-loop to the stud on each guide.

g. Apply a small amount of #242 Loc-Tite to the stud threads and replace the four (4) hex nuts.

G. Column Guide Lubrication - Type 2 units

1. Raise the Elevating Base to highest position. If the the column is raised more tham eight inches, the column sections will separate and the the upper and lower columns will need to be rejoined by following the procedure after step 6 below.

2. Remove the warmer from the base.

3. Apply lubriplate grease (6600-0095-300) to the sliding surfaces of the upper elevating column (located at inside four corners).

4. Lubricate the slide blocks and slots where the slide blocks ride.

5. The actuator screw should also be lubricated at this time. Apply lubriplate to the exposed threads of the screw.

6. It is not necessary to lubricate the 2 round disk glides located at the front bottom of the upper elevating column.

If the columns become separated

a. Spread each of the four spring tensioned bearing pairs apart and insert a 4.5 inch long spacer between the slide blocks on the inside of the lower column.

b. Slide the upper column down over the inner column.

c. Mate the 2 upper shock mount studs with the holes in the upper column flange and install the lockwashers and nuts.

d. Remove the spacers from between the bearing pairs.

e. Re-assemble warmer to base.

H. Elevating Base Reassembly

1. To reassemble the elevating base, reverse the steps of 5.6A. When reinstalling the motor jack shaft assembly, make sure that both lock washers (inside and outside) are in position at the top of the jack shaft as shown in Figure 5-19. Refer to Figure 5-20 for the wire harness connector pin assignments. Make sure the pins are securely locked in the connector. The locking tangs on the pins sometimes remain retracted after removing them and must be bent back out to lock in place properly.

2. Perform the electrical safety and calibration procedures in section 4. Perform the checkout procedures detailed in section 2.2

I. Footswitch replacement, Type 2 units only

1. To remove the old footswitch, first peel the footswitch membrane from the warmer base, making note of how the membrane fits against the guide bar. Then pull the footswitch ribbon cable tail up through the slot in the base. To disconnect the left footswitch, peel off the two adhesive connector retainers, then unplug the two connectors from the footswitch connector, making note of their orientation.

   Important: Be sure to remove all the adhesive residue from the warmer base. Leaving old adhesive on the warmer base surface may cause the new footswitch to fail prematurely.

2. Connect the new footswitch to the two connectors in the same orientation as the old footswitch. Peel the backing off two of the adhesive retainers, and sandwich them around the connectors. Push the cable back down in the slot.

3. Peel the backing off the footswitch membrane and position it on the warmer base so that it lines up flush against the guide bar. Be careful not to let the ribbon cable tail stick to the membrane adhesive.

   Note: The right footswitch has only one connector that mates with the ribbon cable tail.

5.7 Caster Replacement (All Models)

Use the following procedures to replace the casters on all IWS models. Section A applies to all IWS models except the model 3500. Section B applies to the model 3500 Warmer. Section C applies to the Model 3500 Bassinet. Before starting to replace a caster, be sure you have the assistance of another person and the correct replacement parts. When replacement is completed, perform the indicated checkout procedures.

WARNING

⚠ **Due to the size and weight of the warmer at least two people are required to replace a caster.**

⚠ **Before any disassembly or repair disconnect the power supply, gas pipeline supply connections, remove any gas cylinders and remove any accessories from the uprights.**

⚠ **When lowering or lifting the Infant Warmer System to and from the floor for inspection or repair, use two people for safety. Always ensure that you lay the unit on its right side (as viewed from the front) when laying the unit down. The heater/lamp housing does not lock and pivots to the left for access.**

A. Caster Replacement (Except Model 3500)

(See Figure 7-8)

The casters on all models except the 3500 can be replaced with the warmer upright or carefully placed on its right side (facing the front.)

1. Disconnect the power cord.
2. Disconnect pipeline gas supplies.
3. Remove any gas cylinders and any accessory equipment.
4. Lock or block all remaining casters to keep the unit from rolling around (unless the unit has been laid on its side).
5. Use blocks to support the frame near the caster you are replacing.
6. Remove the plastic end plate from the stand assembly.
7. Use a 7/8" socket and ratchet to remove the caster mounting nut.

   Note: There is another nut underneath the caster. You may have to hold this nut while removing or tightening the caster mounting nut.
8. Tilt the unit (unless the unit has been laid on it's side); remove the old caster and install the new caster .
9. Replace the mounting nut and tighten securely.
10. Replace the plastic end cap.
11. Perform the checkout procedure, section 2.2, and, if the unit was laid on its side, the electrical safety checks, Section 4.

B. Model 3500 Warmer Caster Replacement

(See Figure 7-13)

1. Disconnect the bassinet from the warmer and move it out of the way.
2. Disconnect the power cord.
3. Disconnect pipeline gas supplies.
4 Remove any gas cylinders and all accessory equipment.
6. With the assistance of another person, gently place the model 3500 on its right side (facing the front) on the floor.
7. Make note of the orientation of the caster you are replacing. Using a Phillips screwdriver, remove the four caster mounting bolts and the lock washers.
8 Remove the old caster and install the new one, orienting it like the old one. Be sure to include a lock washer under each mounting bolt.
9. With assistance of another person, place the warmer in its upright position.
10. Perform the checkout procedure, section 2.2, and the electrical safety checks, Section 4.

C. Model 3500 Bassinet Caster Replacement

(See Figure 7-24)

1. Disconnect the bassinet from the warmer and move it away.
2. Remove the drawers (refer to section 5.5) and note their positions for re-assembly.
3. With the assistance of another person, gently place the Bassinet on its side on the floor.
4. Make note of the orientation of the caster you are replacing. Using a 3/16" Allen wrench, remove the four mounting bolts and the lock washers.

5. Remove the old caster and install the new one, orienting it like the old one. Be sure to include a lock washer under each mounting bolt.
6. With the assistance of another person, place the bassinet in the upright position
7. Re-install drawers.
8. Perform the checkout procedure in section 2.2.

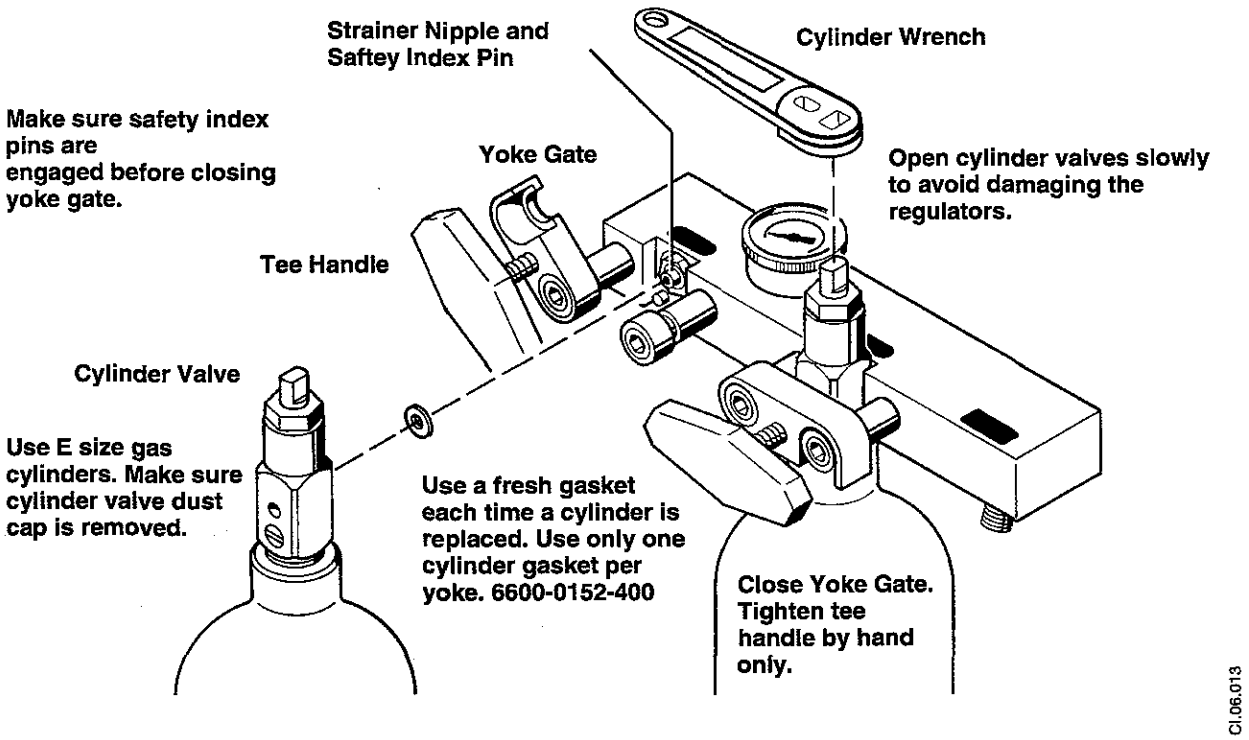

Strainer Nipple and Saftey Index Pin
Cylinder Wrench
Make sure safety index pins are engaged before closing yoke gate.
Yoke Gate
Open cylinder valves slowly to avoid damaging the regulators.
Tee Handle
Cylinder Valve
Use E size gas cylinders. Make sure cylinder valve dust cap is removed.
Use a fresh gasket each time a cylinder is replaced. Use only one cylinder gasket per yoke. 6600-0152-400
Close Yoke Gate. Tighten tee handle by hand only.
CI.06.013

Figure 5-23
Oxygen Manifold Maintenance

Vac Kote is a trademark of Ball Corporation.

5.8 Oxygen/Air Yoke Manifold Repairs

WARNINGS

⚠ **Never oil or grease oxygen equipment unless a lubricant that is made and approved for this type of service is used. Oils and grease oxidize readily, and in the presence of oxygen, will burn violently. Vac Kote is the oxygen service lubricant recommended (Stock No. 6700-0092-200).**

⚠ **Before any disassembly or repair disconnect the electrical supply, gas pipeline supply connections and remove any gas cylinders.**

⚠ **Only competent individuals trained in the repair of high pressure gas equipment should attempt to service it. Unqualified repairs may result in serious injury or equipment damage.**

5/Repair and Disassembly

A. General Safety Guidelines

1. Work in a clean area with clean tools and keep parts on a clean surface.
2. Do not allow dirt, oil, grease, or other combustibles to come in contact with the regulator or other parts.
3. Use only nitrogen or dry, compressed air to blow a part clean or dry. Never use compressed air containing oil: it can create a fire hazard.
4. Always use the correct socket, box or open end wrenches. Never use a pliers, pipe wrench, or adjustable wrench.
5. If you have even the slightest doubt about the condition of a part, replace the part.

WARNING

⚠ **When servicing an oxygen manifold, use only new Ohmeda parts as shown in this manual. Because of the high pressure gas application, it is essential that you never substitute parts from another manufacturer or use parts that are not clean for oxygen service.**

B. General Maintenance Procedures

Before any yoke manifold repairs:

1. Disconnect the warmer from the AC power source.
2. Disconnect pipeline gas supplies.
3. Remove any gas cylinders. (See Figures 5-23 and 5-24)

These procedures apply to both the two cylinder oxygen manifold and the three cylinder air/oxygen manifold.

Periodically (at least once a year) lubricate the Tee handle threads with a small amount of oxygen service lubricant (Stock No. 6700-0092-200). This will prolong their life and make sealing of the yoke gaskets easier.

Periodically (at least once a year) inspect the yoke check valve strainer nipples and replace as required. Momentarily open and then close the cylinder valve before installing cylinders to blow any foreign material from the valve. When installing fresh cylinders, remove the old gasket and use a single, clean, new gasket in its place.

CAUTION

⚠ Use only one cylinder gasket per yoke. Using more than one gasket could cause a cylinder gas leak.

Note: If the oxygen pipeline inlet check valve leaks, the problem may be caused by the steel ball (stock no. 0409-1697-000) getting caught in the spring (see Figure 5-25). To correct this problem remove the elbow and spring. Discard the spring and replace it with screen (Stock no. 6600-0461-400). Reassemble the valve ensuring the ball and O-rings are in place as shown in the figure.

C. Use of Pipeline Air and Oxygen Supplies

1. Connect pipeline supply(s) to appropriate pipeline inlet(s).
2. Connect desired equipment to the appropriate outlet(s).
3. Ensure correct operation of the secondary pipeline equipment.

Apply Teflon® tape around all pipe threads. Wrap the tape clockwise, starting one thread up, as viewed from the end of the male fitting. Apply enough pressure so the tape just starts to follow the contours of the threads. Wrap two layers of tape.

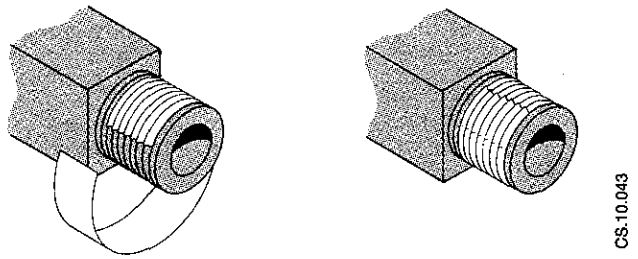


Figure 5-24
Applying Teflon Tape.

To operate, open cylinder valves S-L-O-W-L-Y, and rotate cylinder valves until fully open.

CAUTION ⚠ Open cylinder valves S-L-O-W-L-Y to avoid damaging the regulators.

D. Gauge Replacement

WARNING ⚠ **When replacing gauges, verify that pressure range of the replacement gauge is the same as the one you are replacing, and that the correct gas is shown.**

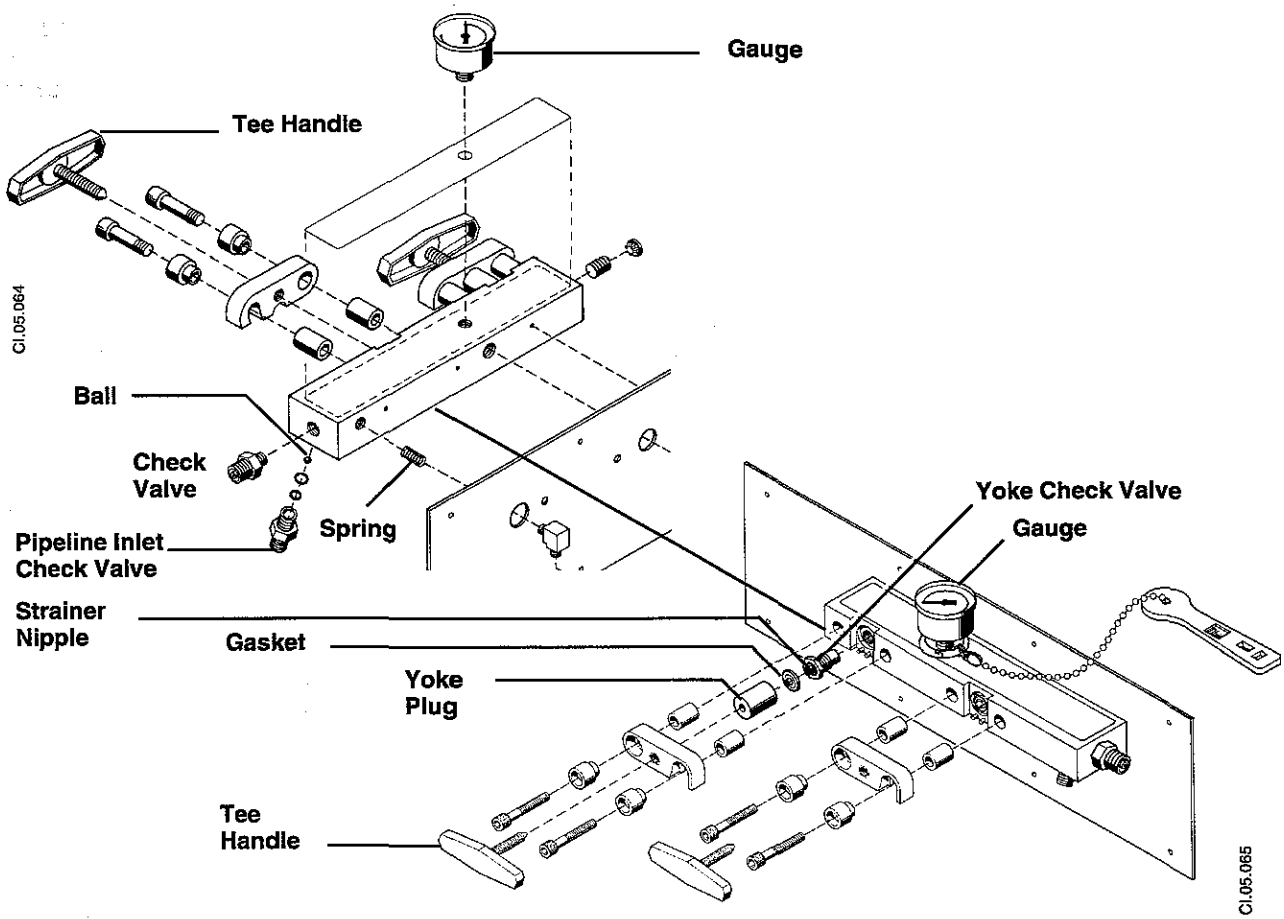


Figure 5-25
O_2 Manifold Assembly (Air/O_2 Manifold Assembly not shown)

1. Turn off gas supply and bleed off any system pressure.
2. Use a 7/16 inch open end wrench and turn the gauge counterclockwise to remove it.
3. Remove any Teflon tape remnants from the threads.
4. Apply Teflon tape around the threads of the new gauge .
5. Install the new gauge by turning it in clockwise. Do not over-tighten. Position the gauge as shown in Figure 5-25.
6. Perform leak test according to section 5.8 G.

E. Gauge Lens Replacement

1. Turn the lens cover counterclockwise to remove it. Check that the gauge is not damaged.
2. Clean both sides of the replacement lens.
3. Place the lens cover in position over the gauge face and turn the lens clockwise. Do not over-tighten.

F. Strainer/Tee Handle Replacement

Periodically (at least once a year) inspect the strainer nipples and replace as required. The strainers are located in the cylinder yokes of the gas supply modules. Remove the gas cylinder, if present. With the yoke gate swung out of the way, use a flat-tip screwdriver to unscrew the strainer. Screw the replacement strainer snugly into place. Install yoke plugs and gaskets on unused yokes to prevent dust and lint from accumulating in the strainers or leakage occurring through unused cylinder yokes. Check that the correct gas cylinders can be properly attached to the yokes.

The tee handle screw can be unscrewed from the yoke gate and replaced if necessary.

G. Leak Testing the System

Prior to initial use and as prescribed by hospital protocol, the yoke system(s) should be checked for leaks according to the following procedure:

I. Discontinue use of the system to be tested.
2. Disconnect all pipeline gas supply and outlet lines from the yoke assembly.
3. Use new gaskets and full cylinders at each cylinder port (optionally, one full cylinder and a yoke plug may be used on a 2 cylinder oxygen manifold)
4. Open a cylinder valve at each manifold to charge the manifold(s) to a minimum of 745 psig (5137 kPa) and then close the valve(s).
5. Note the gauge pressure reading in the manifold(s).
6. After one minute, check the gauge pressure reading(s) again. The pressure gauge needle should not drop visually. If there is a visual pressure drop, discontinue use of the gas system and have the yoke assembly repaired by a qualified service person.

H. Yoke Check Valve Replacement

The yoke check valve permits a depleted cylinder to be replaced while the other cylinder continues to furnish oxygen.

WARNING: ⚠ **Do not use oil or oil bearing materials on or near the regulator. Oils and greases oxidize readily and, in the presence of oxygen, they will burn violently. The air or oxygen regulators or any regulator parts must be discarded if contaminated with oil or grease.**

CAUTION: ⚠ Yoke check valves are not intended to provide a leak free seal; always use a yoke plug and a fresh cylinder gasket to seal an unused yoke.

Replace the check valve if a large leak is detected when changing the cylinders.

1. Remove the gas cylinder(s), if present and bleed off any system pressure. With the yoke gate swung out of the way, use special socket tool (stock no. 0175-0420-000) to remove the check valve from the manifold block.
2. Always install a new sealing washer when installing a yoke check valve .
3. Tighten the check valve to 15 - 20 lb. ft. torque. Do not over tighten.
4. Check that the correct gas cylinders can be properly attached to the yokes. Perform leak test according to section 5.8G.

I. High Pressure Regulator Replacement and Adjustment

(See Figure 5-26 and 5-27)

Replace regulators every 5 years

WARNING: ⚠ **Do not use oil or oil bearing materials on or near the regulator. Oils and greases oxidize readily and, in the presence of oxygen, they will burn violently. The air or oxygen regulators or any regulator parts must be discarded if contaminated with oil or grease.**

1. Disconnect the gas pipeline connection(s) and remove the gas cylinder(s). Bleed off any system pressure.
2. Remove the mounting screws for the Yoke and Regulator Assembly and then remove the assembly.
3. Disconnect the copper tubing from the outlet port of the regulator and the elbow of the manifold port. Remove the outlet port fittings and copper tubing.
4. Remove the regulator from the manifold block by turning it counterclockwise. Remove any Teflon tape remnants from the threads.

5. Attach the new regulator to the manifold block. Use Teflon tape to seal the thread connections. Tighten to ensure there are no leaks. Position the regulator the same way as the original regulator. See Figure 5-27. Replace the outlet port fittings and copper tubing.

6. Perform leak test according to section 5.8 G.

7. Adjust the regulator following the instructions in section 4.4.

8. Place the assembly in position and replace the eight mounting screws.

9. Perform leak test according to section 5.8 G.

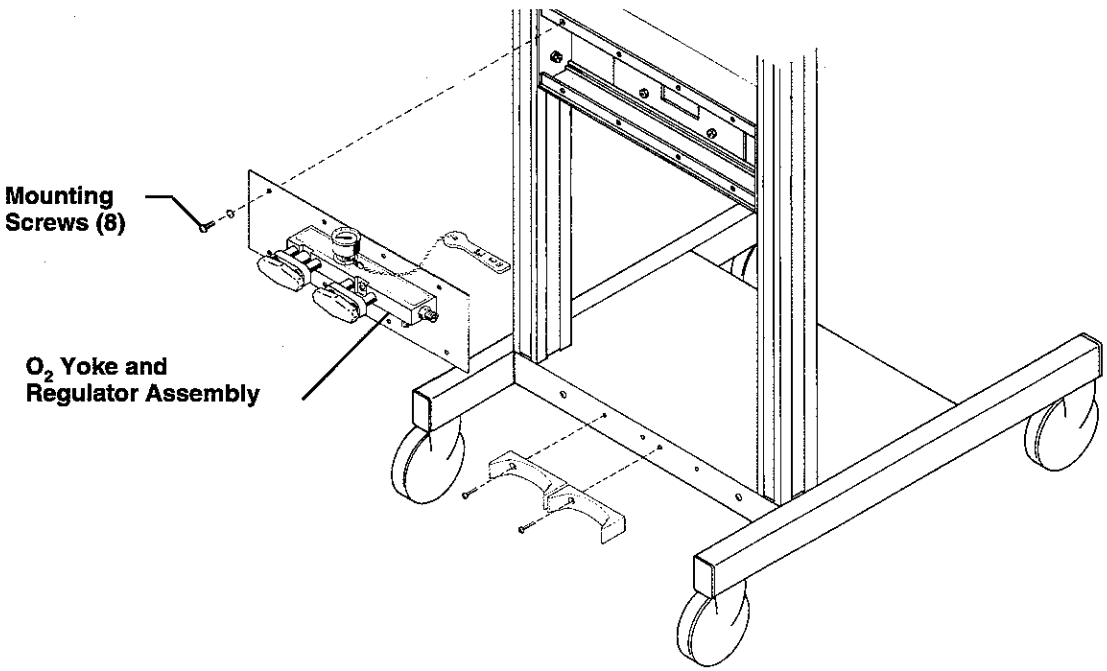


Figure 5-26
Manifold Assembly Removal

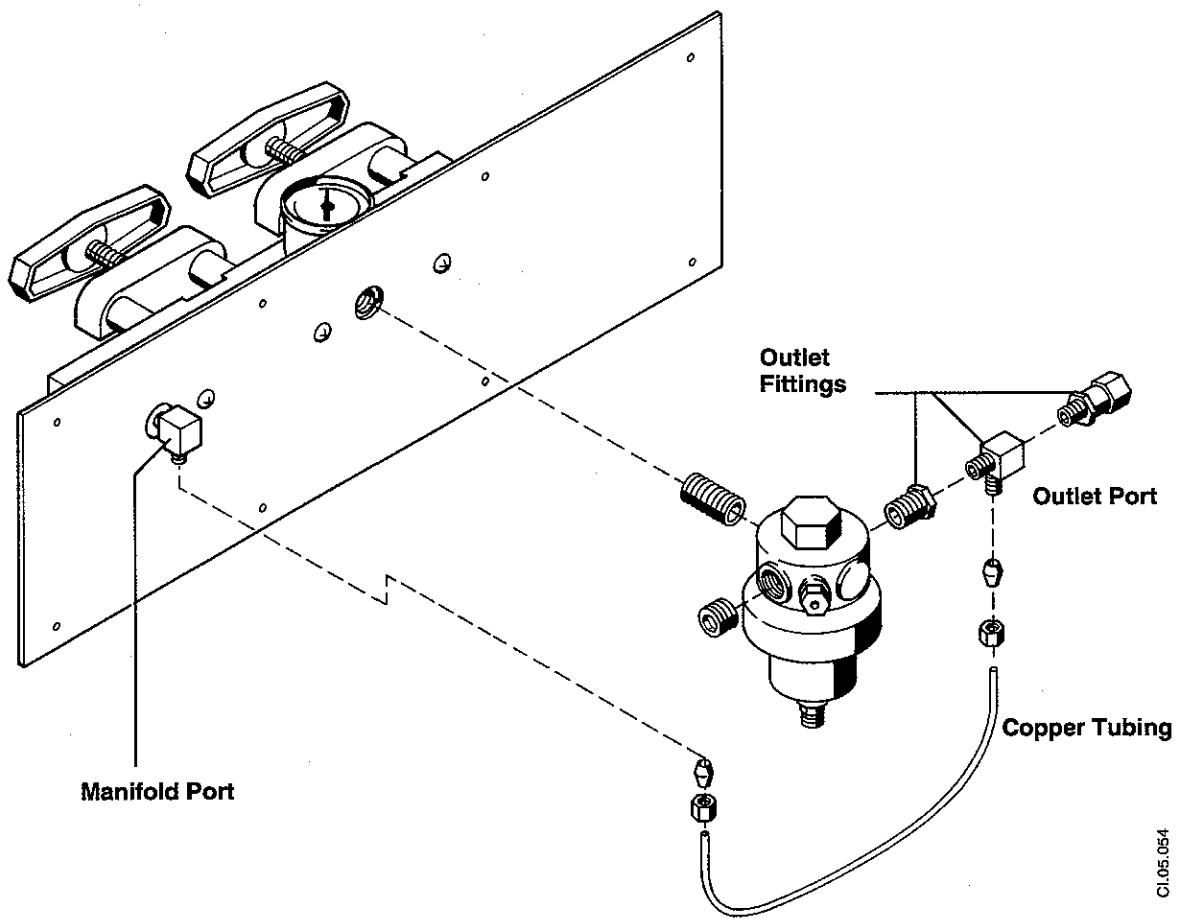


Figure 5-27
High Pressure Regulator

I. Pneumatic Troubleshooting

This troubleshooting information provides a list of some problem conditions, possible causes, and solutions. If any of the below symptoms occur, shut off the cylinder valve and correct the problem before continuing to use the system.

Condition	Possible Cause	Solution
Gas leakage when cylinder valve is opened.	Dirty, old, missing or multiple cylinder gaskets.	Install new gasket.
	Leaking pipeline inlet or supply check valves.	Check operation of check valves.
		Check that the ball is not stuck up inside the manifold or spring. Replace the spring with a screen (see parts section 7).
Gauge reading drops with cylinder valve closed.	Missing yoke plug on unused yoke.	Install new yoke plugs.
	Leaking check valves, fittings, regulators or gauges.	Replace components.
Improper gauge operation incorrect gauge readings.	Damaged gauge.	Replace gauge.
Gas leakage at the regulator outlet when the adjustment screw is completely released.	Leaking regulator.	Replace regulator.
Outlet pressure increases steadily above set pressure (no flow through system).	Leaking regulator.	Replace regulator.
Gas leakage from regulator case.	Leaking regulator.	Replace regulator.
Excessive drop in working pressure after the regulator pressure has been set.	Worn or sticking in-internal parts. Internal flow obstructed, or dirty filter. Cylinder valve not fully open. Dirty yoke check valve strainer nipple.	Replace regulator. Check for flow obstructions. Fully open cylinder valve. Replace strainer nipple.
Gas leakage from regulator or safety relief valve.	Leaking regulator or safety relief valve.	Replace regulator or safety relief valve.
Incorrect working pressure.	Regulator requires pressure adjustment.	Adjust pressure.

6/Troubleshooting and Testing

WARNING ⚠ **Use extreme care while performing calibration and adjustment procedures, or while working on the Ohio Infant Warmer System with power connected. An electrical shock hazard does exist; be certain to observe all standard safety precautions.**

CAUTION Use the Static Control Work Station to help ensure that static charges are safely conducted to ground. The Velostat material is conductive. Do not place electrically powered circuit boards on it.

Note: Self test programs stop when a system error code is detected. Therefore a second error code will not be displayed for another failure. The same failure can trigger more than one error code. The actual code that appears is determined by the point in the test loop where the fault occurs.

Note: SW1 on the ThermaLink board (if present) should be in the OFF position.

For maximum reliability and ease of troubleshooting, the IWS features three levels of testing; Power-Up Self tests, On Line Self tests, and On Demand Self tests.

Power up tests are performed only on power up. On line tests are performed continuously during operation to verify proper functioning. Control panel switches activate on demand tests that can be used to assess error codes.

To facilitate service of older IWS units manufactured prior to software revision 4.01, a separate section on self test functions has been included in this section. Section 6.1 describes the self test functions for units with software revision 4.01 or higher. Section 6.2 describes the self test functions for all units prior to software revision 4.01.

Software revision 04.01 and higher

6.1 Self Test Functions

(units with Software Revision 4.01 or higher)

6.1.1 Power Up Testing

When power is first applied, the following self tests are performed. If a failure is detected, the error code appears in the elapsed time display. If no error is detected, the tests are transparent to the user.

RAM test (Error 05)
Instruction test (Error 01)
Checksum (Error 04)
Safety relay (Error 16)*

* This is the only routine that checks for this error.

6.1.2 On Line Testing

The following self tests are performed continuously during normal operation. If a failure is detected, the error code appears in the elapsed time display.

RAM test (Error 05)
Checksum (Error 04)
ADC calibration (Errors 02 and 03)
Triac or solid state relay fails to respond to software control (Errors 12 and 13)
ADC not converting (Error 07)
Audible alarm failure (Error 14)
Software upsets (Errors 15, 17, and 19)
Line voltage out of range (Error 10)*

* This is the only routine that checks for this error.

6.1.3 On Demand Testing

There are two types of on demand testing. Calibration routines that let you test and adjust specific circuits and switch activated displays that display actual readings to assist in troubleshooting (e.g. the number of software time outs).

A. Calibration Routines

Calibration routines let you adjust specific circuits by depressing a switch during power up. You must switch the power off to exit these routines.

Test	Description	Applications	External Selection
ADC Calibration	Elapsed time display shows patient temp to two decimal places even if outside normal display range. 2KHz alarm active	Display Brightness adj. ADC calibration Alarm freq. adj.	Depress Start/Hold switch at power up
% Line Voltage	% of rated line voltage appears in elapsed time display. 2KHz alarm active	% line voltage calibration	Depress Reset switch at power up

The control and patient temperature displays tell you if you are in a calibration mode and identify the routine:

- In the ADC Calibration routine, the letters "CAL" appear in the patient temperature display and the letters "AdC" appear in the control temperature display.
- In the% Line Voltage Calibration routine, the letters "CAL" appear in the patient temperature display and the letters "LI." appear in the control temperature display.

Note: On IWS 2001 International units, "CAL" appears in the patient temperature display regardless of which calibration routine is selected. If the value in the elapsed time display changes when you unplug, warm, or cool the patient probe, you are in the ADC calibration routine.

B. Switch Activated Displays

Switch activated displays show parameters, such as the % line voltage, on the controller front panel for easier troubleshooting.

In normal operation the Alarm Silence, the Start/Hold, and the Apgar Tones switches activate service displays when held down for more than five seconds. The high priority alarm also sounds to indicate that actual patient temperatures are not displayed. The normal display reappears when you release the switch.

The following table summarizes the data that will be displayed when each switch is depressed and held for at least five seconds. It is intended as a quick reference. Switch applications for troubleshooting are discussed in Section 6.3 under the individual error codes.

Activation	Description	Related Errors
Depress Alarm Silence for 5 sec	All LEDs and Display segments illuminate	None
	Phased in high priority alarm (alternating two tone) sounds.	None
Depress Start/Hold for 5 sec	Displays show converted values of:	
	Patient temp: Cal high temp to 1 decimal pl (25.05 ± 0.3°C)	Error 03
	Control temp*: Cal high temp to 1 decimal pl (37.96 ± 0.3°C)	Error 02
	Elapsed time: % line voltage to 1 decimal pl (% nominal ± 2%)	Error 10
Depress Apgar Tones for 5 sec	Displays show converted values of:	
	Patient temp: Pxx (xx = number of watchdog circuit time outs)	Error 19
	Control temp*: Hyy (yy = number of heater cycles per sec)	
	Elapsed time: Patient temperature (2 decimal places)	

* IWS 2001 International units do not have a control temperature display.

6/Troubleshooting and Testing

C. Self Test Loop

1. Self Tests

To enter this loop depress and hold the Apgar tone switch while powering up the unit. The microcontroller cycles through a series of self tests, including:

All of the power up tests

Instruction Test (E01)
EPROM Checksum Test (E04)
RAM Test (E05)

The following on line self tests

ADC High Calibration Failure (E02)
ADC Low Calibration Failure (E03)
ADC Failure (E07)
Heater Not Switching On (E12)
Heater Not Switching Off (E13)
Alarm Oscillator Failure (E14)
ThermaLink Self Test*

Important : Unless you specifically want to repeat the power up tests, troubleshooting should be performed in the normal operational modes.

2. Displays

The display loop runs simultaneously with the self tests, displaying frames of data and testing for proper LED operation. An alternating two tone alarm sounds continuously during the test. Frames are cycled as follows:

Temperature Displays

Frame	Patient Temp.	Control Temp.	Elapsed Time.
1.	——— All displays blank———		
2.*	rs	232	PASS /FAIL
3.	Patient Temp.†	Blank	00:00
4.	Low Cal. Point	High Cal. Point	%Nom. Voltage x .1
5.	— all segments of all displays are lit —		

*Only on controllers with 4.00 software or higher. Units without RS232 option installed will display rs232 FAIL.

† Only when the probe is connected, otherwise display is blank.

D. ThermaLink Communication Option Self Test

The RS-232 portion of the ThermaLink communications option, available only on controllers with 05.00 software or higher, can be tested by setting switch SW1 (if present) on the optional ThermaLink board to the ON position, or by shorting pins 2 and 3 on the ThermaLink Connector. Disconnect cable to other equipment before testing. Press the Apgar tones switch while powering up the unit. Release the switch when a continuous alarm sounds. If the RS-232 is functioning, the displays will cycle to a frame that shows:

Patient Temp	Control Temp	Elapsed Time
rs	232	PASS

On units with boards with no test switch, the first pass through may indicate "rs 232 FAIL" due to the varying warm-up times of the ThermaLink board and the control board. Do not shut the unit off; continue to run the test. If the ThermaLink board is functioning correctly, the display should show "rs 232 PASS" in all subsequent cycles.

Conversely, if the RS-232 is not functioning or is not installed, the temperature displays will cycle to a frame that shows:

Patient Temp	Control Temp	Elapsed Time
rs	232	FAIL

At the end of this test, be sure to set SW1 (if present) to the OFF position for normal operation.

6.2 Self Test Functions

(units prior to Software Revision 4.01)

The following text is a description of the self test functions performed by the infant warmer. If an error results on any of the power-up or on-line tests then the error number will be displayed on the elapsed time display in the format E ##. The high priority alarm (System Failure LED) will be ON and cannot be silenced. Power must be switched OFF to reset this alarm.

6.2.1 Power Up Testing

On power up the following tests are performed.

1. Instruction Test (Error #01)

   Selected instructions are tested and verified operational.

2. Checksum (Error #04)

   The hex values of EPROM locations from 0000 to 3FFD are added together and a 2 byte sum is stored. EPROM locations 3FFE and 3FFF contain a 2 byte number which when added to the calculated checksum should total zero.

3. RAM Test (Error #05)

   RAM locations 10 through 7F are tested with patterns of 00,FF,AA, and 55.

4. Test Port 1 Lines (Error #06)

   The port one I/O lines are tested to verify they can be toggled.

   NOTE: At power up the software revision number is displayed for 1 second in the elapsed time display, after the LED segment test.

6.2.2 On Line Testing

The following tests are run during the normal operation of the software. An error on any of these tests results in a System Failure alarm.

1. ADC Calibration Test (CAL High Error #02, CAL Low Error #03)

   Verifies that readings of the precision calibration resistors are within 0.3 degrees of the nominal values.

   These readings can be checked by depressing the hidden switch on the display panel (located directly above the alarm silence switch) for 2 seconds.

   After 2 seconds the displays should indicate as follows:

   Patient Temperature is 25.0 ± 0.3 degrees.

   Control Temperature is 37.9 ± 0.3 degrees.

2. Hardware Triac Test (E#025 03.11 Software only)

   A circuit independent of the microcontroller monitors that the microcontroller can switch the heat OFF. Every 3 minutes 24 seconds in 60 Hz operation (4 minutes and 5 seconds for 50 Hz operation) a request is made to the microcontroller to switch the heat OFF. If the heat does not go OFF, a hardware latch is latched and a relay contact is opened so there is no heat. This verifies that the triac is not shorted and that the microcontroller is still able to control the heat. This failure does not display an error number because it is not controlled by the microcontroller but will cause the software triac test to fail when heat is called for by the program.

3. ADC Convertor Not Converting (Error #07)

   Verifies that the ADC conversion complete occurs within 1 second.

4. Hardware Triac Timer Not Running (Error #08)

   Verifies that the request from the hardware triac test circuit occurs within 256 seconds.

5. Software Triac Test (Error #09)

   The heater status line is checked to verify that the heat is ON when the micro is switching it ON. This verifies that the triac is not failed open.

6. Line Voltage Out of Range (Error #10)

   Verifies that the line voltage is within the range of 82.6% to 117.4% of nominal input voltage. (95v to 135v, for 115v units)

6.2.3 On Demand Testing

Diagnostic testing can be accessed by one of the following:

1. Depressing and holding the Apgar Tones switch while powering up unit. This causes the unit to cycle in the self test loop until power is removed. See self test loop.

2. Selecting one of the test positions on the 4 position DIP switch located on the control board. Following is a description of the functions of the DIP positions:

   a. Switches All Open (OFF) Normal Operating Position.

   b. Switches 2,3,4, Closed (ON) and Switch 1 Open (OFF) Hardware Triac Test

      This mode is used to test the hardware triac test circuit. (See Section 4)

   c. Switches 1,2,3, Open (OFF) and Switch 4 Closed (ON)

      ADC Calibration

      The system displays the actual ADC counts on the elapsed time display, the patient temperature on the patient display even if outside of the normal displayed range, and the % of nominal line voltage on the control display. This position is used for calibrating the analog to digital converter and the line voltage compensation circuit.

   d. Switches 1,2,4 Open (OFF) and Switch 3 Closed (ON)

      Alarm Calibration

      All segments of all LEDs are lit. The heater, overhead alarm lamps, and the observation lamp are on. The audio alarm emits a steady low

      priority alarm sound. The 2 kHz alarm frequency can be adjusted using this mode.

   e. Switches All Closed (ON)

      Self Test Loop

      In this mode the unit cycles through a display test, checks ADC calibration, cycles the heater, alarm lights, and observation lights, and steps through the tests described in power up testing. It also monitors the touch switches and sounds the critical alarm while any switch is depressed. If any error occurs the error number will be displayed on the elapsed time display and the critical alarm will sound for two seconds. The program will then continue to loop through this test, even if the 4 DIP switches are returned to Open (OFF).

      If the test loop is entered on power up by depressing the Apgar Tones switch the program will loop until an error is detected. If an error is detected the unit will then stop the test loop, the error code will be displayed in the elapsed time display, and the critical alarm will sound. The power must be switched OFF to exit this mode.

6.2.4 Self Test Loop

The unit cycles in the following loop until the power is removed.

Power up tests performed:

Instruction test	(Error #01)
Check calibrate high	(Error #02)
Check calibrate low	(Error #03)
Checksum	(Error #04)
RAM test	(Error #05)
Test port 1 lines	(Error #06)
Check if ADC is converting	(Error #07)

Display loop test:

Seven Segment Display's	Bar Graph Segments	Alarm LEDs	Mode LEDs	Heater & Lights
All 1's	1,11	Probe fail	Servo	ON
All 2's	2,12	Pat temp	Servo	OFF
All 3's	3,13	Sys fail	Servo	ON
All 4's	4,14	Heater OFF	Manual	OFF
All 5's	5,15	Reset timer	Manual	ON
All 6's	6,16	Spare LED	Manual	OFF
All 7's	7,17	All OFF	Apgar	ON
All 8's	8,18	All OFF	Apgar	OFF
All 9's	9,19	All OFF	Apgar	ON
All 0's	10,20	All OFF	All OFF	OFF
All OFF	All OFF	All OFF	All OFF	OFF

The unit returns to start of self test loop.

6.3 Troubleshooting Error Codes

Important: The recommended service policy is to limit repair procedures to sensor or board replacement, or in some cases the replacement of EPROMs. Additional information is provided for the purpose of identifying the faulty assembly.

Error codes are a subset of the system failure alarm. When an error code is triggered, an alternating two tone alarm sounds, the heater is automatically shut off, and normal warmer operation stops. However, the patient display continues to update, and the various on demand test functions are still available.

This section individually discusses each error code.

During a system failure alarm, the error code appears in the elapsed time display in the format E0##. A nonsilenceable, high priority alarm sounds and the System Failure LED illuminates. You must switch the power OFF to reset this alarm.

Note: Excessive EMI levels in the hospital environment can trigger the system failure alarm. Note the error code and switch off the unit. Wait ten seconds and switch the unit back on. If the system failure alarm recurs, remove the Infant Warmer from use until it has been repaired.

A. E01, Instruction Test Failure

A software routine executes selected instructions from the 8032 microcontroller. The results are then checked and if any mistakes are found this error is triggered.

To repeat the test, cycle the power off and back on. If the error recurs, replace the control board or kit.

B. E02, ADC High Calibration Failure

The reading from the ADC calibrate high resistor (5.76 k), has exceeded the limits of 37.96 ± 0.3°C for one minute (or two consecutive ADC readings on boards prior to 4.01 software). This corresponds to a voltage of approximately 540 mV at the multiplexer input (U12 pin 14).

To see if the ADC requires calibration, depress the hidden switch located above Alarm Silence for five seconds; the low calibration test point (25.05 ± 0.3°C) will appear in the patient temperature display and the high calibration reading (37.96 ± 0.3°C) will appear in the control temperature display (except on IWS 2001 units, which do not have a control temperature display). If both readings exceed or nearly exceed the limits, calibration is required or resistor R30 may be out of tolerance. If the problem persists replace the control board or kit.

C. E03, ADC Low Calibration Failure

The reading from the ADC calibrate low resistor (10 k), has exceeded the limits of 25.05 ± 0.3°C for one minute (2 consecutive readings on control boards prior to 4.01 software). This corresponds to a voltage of approximately 690 mV at the multiplexer input (U12 pin 13).

To see if the ADC requires calibration, depress the Start/Hold switch for five seconds; the low calibration test point (25.05 ± 0.3°C) will appear in the patient temperature display and the high calibration reading (37.96 ± 0.3°C) will appear in the control temperature display (except on IWS 2001 units, which do not have a control temperature display). If both readings exceed or nearly exceed the limits, calibration is required or resistor R29 may be out of tolerance. If the problem persists, replace the control board or kit.

D. E04, Checksum Failure

The results of the EPROM memory checksum differ from the correct result stored at memory locations 3FFE and 3FFF on U9.

There are no related test points. To repeatedly check for this alarm, switch off the unit and wait ten seconds; then switch it back on. If the error recurs, replace the EPROM (U9) and repeat the previous check. If the error recurs, replace the control board or kit.

E. E05, RAM Test Failure

The data read from a RAM memory location differs from the test pattern written to it.

There are no related test points. To repeatedly check for this alarm, switch off the unit and wait ten seconds; then switch it back on. If the error recurs, replace the control board or kit.

F. E06, Port 1 (Prior to 04.01 Software only)

Data being read back on Port 1 does not agree with the data written to the port. These signals cannot be monitored and there are no related test points. If the problem persists, replace the control board or kit.

G. E07, ADC Converter Failure

The Conversion Complete Signal from the ADC does not occur within five seconds of the Start Conversion signal from I/O expander U2.

Do not attempt to monitor these signals; the Start Conversion and the Conversion Complete pulses are extremely narrow with durations of only a few nano seconds. Verify that no conversions are being completed by heating or cooling the patient temperature probe and observing that the temperature display does not update, then replace the control board.

H. E08, Hardware Watchdog Timer (Software Revision 01.00 only)

The hardware watchdog timer is not functioning and timing out properly. There are no associated test points. Replace the control board.

I. E09, Heater Control (Prior to 04.01 Software only)

The heater triac or solid state relay or driving components are defective and are not allowing the radiant heat to be controlled. Verify that all the interconnecting cables are properly connected and making good electrical contact. Also verify for correct control signals from the control board. Replace the solid state relay (if applicable). If the problem persists, replace the power supply board.

J. E10, Line Voltage Out Of Range

Note: This alarm generally indicates a need for calibration.

The line voltage compensation signal from the power supply board converts to a voltage outside the allowed range, 82.6% to 117.4% of the nominal voltage (86.1% to 122.5% for 230 V). Line voltage fluctuation greater than 10% of a unit's nominal voltage will affect heater output.

Check the line voltage at the power outlet. If it is outside the alarm range, connect to a different power source. If it is within the acceptable range, calibrate the line voltage compensation circuit (see Section 4.2.6 or 4.3.5). If the circuit can't be calibrated or if the problem is interrmittent, replace the 16 pin ribbon cable between the power supply and the control boards. If this does not correct the problem, replace the power supply board.

Labeled Voltage	Nominal Voltage	Power Supply Range (alarm limits)
100 V	95 V	82.6 to 117.4 V
120 V	115 V	95 to 135 V
220 V	220 V	181.7 to 258.3 V
230 V	230 V	198.2 to 281.8 V
240 V	240 V	198.2 to 281.8 V

K. E12, Heater Not Switching On (Revision 04.01 Software and higher)

The microcontroller has commanded the heater to switch on (U1 pin 16 high) but the heater status signal indicates that the heater is off (U2 pin 14 low; heater status LED off).

Verify the proper heater command and the heater status signal levels. Also verify that heater rod wires are properly connected and making good electrical contact. The most probable cause of this alarm is an open solid state relay (or triac in some older IWS models) or a problem in the power supply board's heater drive circuit. Replace solid state relay (if applicable). If problem persists, replace power supply board.

L. E13, Heater Not Switching Off (Revision 04.01 Software and higher)

The microcontroller has commanded the heater to switch off (U1 pin 16 low) but the heater status signal indicates that the heater is on (U2 pin 14 high; heater status LED illuminated).

Verify the proper heater command and the heater status signal levels. Also verify that heater rod wires are properly connected and making good electrical contact. The most probable cause of this alarm is a shorted solid state relay (triac in some older IWS models) or a problem in the power supply board's heater drive circuit. Replace solid state relay (if applicable). If problem persists, replace power supply board.

M. E14, Alarm Oscillator Failure (Revision 04.01 Software and higher)

An alternating two tone alarm signal has been activated (high priority alarm line) but the 2 kHz signal at test point 1 (also U2 pin 16) is not toggling.

To troubleshoot this failure, an alternating two tone alarm must be active. To activate the alarm circuit, depress the Reset switch during power up. If the problem persists, replace the control board.

N. E15, Software Upset RAM Error (Revision 04.01 Software and higher)

A software upset has caused the watchdog timer to time out and the system is unable to recover because critical parameters (e.g. control temperature) stored in the RAM may have been altered. This error does not necessarily indicate a hardware failure.

Note: Excessive EMI levels in the hospital environment can trigger the system failure alarm. Note the error code and switch off the unit. Wait ten seconds and switch the unit back on. If the system failure alarm recurs, remove the warmer from use until it has been repaired.

Switch the unit off and back on. If the error does not recur, allow the unit to run for half an hour. Then check the number of recoverable software upsets that have occurred

by depressing and holding the Apgar Tones switch for at least five seconds. If PFF appears in the patient temperature display, no software upsets have occurred. Complete the Checkout Procedure and return the unit to service. If another value appears in the patient temperature display, replace the control board.

O. E16, Safety Relay Not Opening Properly (Revision 04.01 Software and higher)

On power up, the software performs tests to verify that, if the watchdog timer is not pulsed, the safety relay opens. If the microcontroller does not sense the contacts opening, the System Fail Alarm is activated.

To repeat the test, cycle the power off, wait 5 seconds, then turn the power back on.

The most likely cause for this failure is a defective power supply board, but it can also be caused by a bad control board.

P. E17, Software Upset (Revision 04.01 Software and higher)

For some unknown reason, the software is not cycling through all of the routines and is unable to recover. This error does not necessarily indicate a hardware failure.

Note: Excessive EMI levels in the hospital environment can trigger the system failure alarm. Note the error code and switch off the unit. Wait ten seconds and switch the unit back on. If the system failure alarm recurs, remove the warmer from use until it has been repaired.

Switch the unit off and back on. If the error does not recur, allow the unit to run for half an hour. Then check the number of recoverable software upsets that have occurred by depressing and holding the Apgar Tones switch for at least five seconds. If PFF appears in the patient temperature display, no software upsets have occurred. Complete the Checkout Procedure and return the unit to service. If another value appears in the patient temperature display, replace the control board or kit.

Q. E19, Software Upset (Revision 04.01 Software and higher)

The watchdog timer has timed out 256 times since power up. This error can be caused by a software upset. This error does not necessarily indicate a hardware failure.

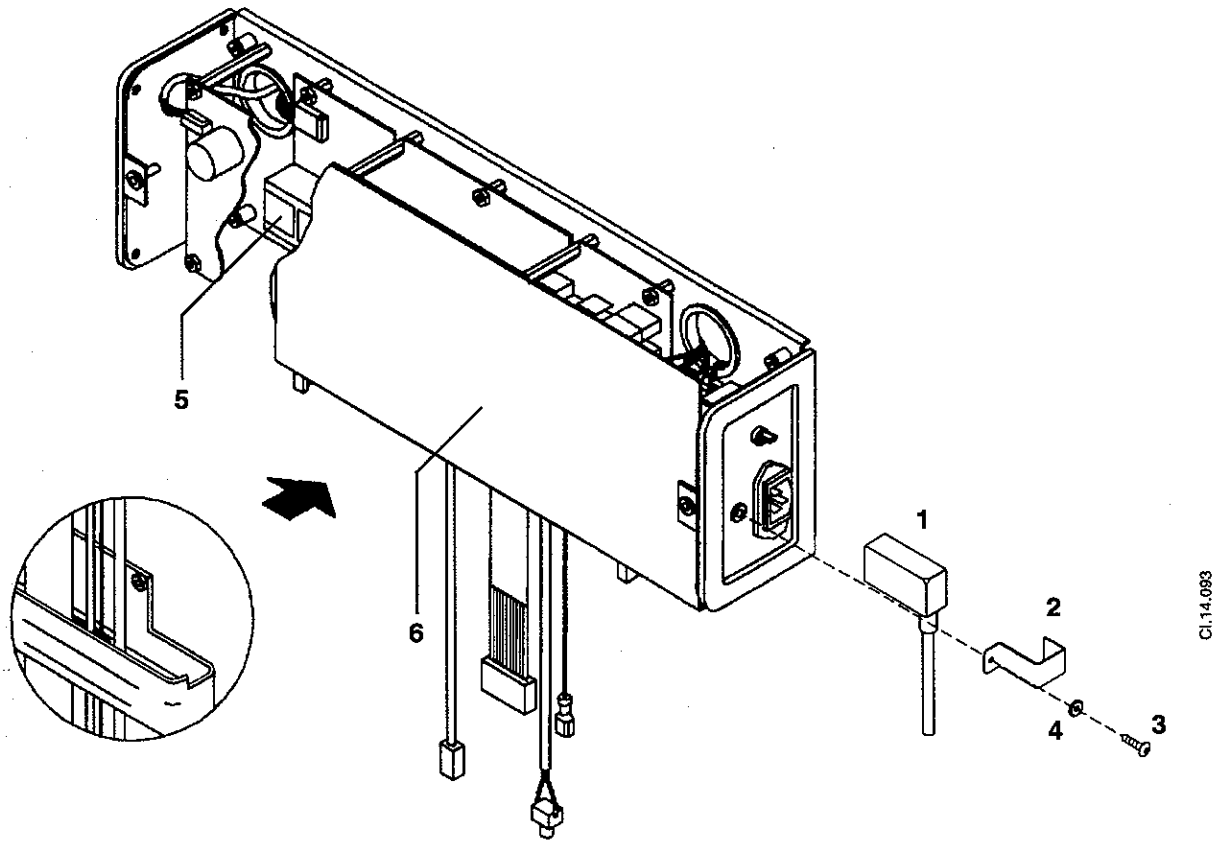
Note: Excessive EMI levels in the hospital environment can trigger the system failure alarm. Note the error code and switch off the unit. Wait ten seconds and switch the unit back on. If the system failure alarm recurs, remove the warmer from use until it has been repaired.

Switch the unit off and back on. If the error does not recur, allow the unit to run for half an hour. Then check the number of recoverable software upsets that have occurred by depressing and holding the Apgar Tones switch for at least five seconds. If PFF appears in the patient temperature display no software upsets have occurred. Complete the Checkout Procedure and return the unit to service. If another value appears in the patient temperature display, replace the control board or kit.

R.E25, Watchdog Circuit Tripped (Software Revision 3.11 Only)

This alarm only triggers in units with software 03.11. It Signals that the heat is not being controlled properly. Switch the unit off and back on. Turn the heat off in the manual mode. Observe LED DS1 on the control board. If the LED is off and the alarm trips the control board is probably defective. If the LED is on either the power supply or the SSR is probably defective.

7.1 Infant Warmer Controller Assembly-1 (All Models)



Description		Stock Number
1.	Power Cord 100/120V units	0208-0950-300
	Power Cord 220/230/240V units (except Australia)	6600-0574-612
	Power Cord 240V unit (Australia)	6600-0574-613
2.	Plug Guard	6600-0572-500
3.	Screw 8-32 x 3/8	6600-0261-400
4.	Lock washer, internal #8	6600-0262-400
5.	Rechargeable 7.2 Battery	0690-1000-310
6.	Control Board ESD Shield†*	6600-0509-500

†Included with noise suppression kit, see page 7-84

* Not present on all units.

Figure 7-1
Infant Warmer Controller Assembly 1 (All models)

7.2 Infant Warmer Controller Assembly-2 (All Models)

	Description	Stock Number
1.	Phone Jack Bezel (black)	0217-5219-100
	Phone Jack Bezel (grey)	6600-0798-501
2	Bezel Label- English	6600-1975-101
	Bezel Label- French	6600-1975-102
	Bezel Label- Spanish	6600-1975-103
	Bezel Label- German	6600-1975-104
	Bezel Label- Italian	6600-1975-105
	Bezel Label- Swedish	6600-1975-106
	Bezel Label- Japanese	6600-1975-107
3.	Patient Cable Harness Assy Kit (includes item 4)	6600-0540-800
4.	Washer, flat	6600-0455-400
5.	Display Board	6600-0102-850
6.	Standoff	0402-0233-300
7.	Brass Washer	0202-4510-300
8.	Screw, 8-32 x2 1/4	0140-4127-236
9.	Screw #6 x 5/8	0142-2833-210
10.	Display box bottom cover* (beige)	6600-0521-500
	Display box bottom cover (light grey)	6600-0521-501
11.	Display box top cover* (beige)	6600-0522-500
	Display box top cover (light grey)	6600-0522-501
12.	Switch panel label -English@	See Label Section
13.	Nut, 6-32 Hex	0144-3324-113
14.	Ground label**	0205-4737-300
15.	Display box grounding spring‡	
16.	Tab Faston 250 SER‡	
17.	Lock washer, #6 int‡	
18.	Display Board ESD Shield†**	6600-0508-500
19.	Snap dome switch panel@	
	Units with HAK, AAN & HCA-Series 3000 & 4000, Model 5000	0208-5129-300
	Units with HCC-Series 3000 & 4000, Model 2001	6600-0468-700
	Model 2001 (Units with HAJ & HCA)	6600-0136-700
20.	Model Number Insert label@	See Label Section
21.	Footswitch cable, controller (Type 2 elevating base units only)	6600-0479-700
22.	ESD cable (for grounding see Figure 7-5)	6600-0541-700

Parts not shown

Skin Temperature Probe LA003 (reusable)	0208-0697-700
Reflective patches, 50/pkg (used with LA003)	0203-1980-300
Skin Temperature Probe LA005 (disposable) pkg/10	6600-0208-700
Probe LA005 pkg/50	6600-0196-700

@ The label adhesive is included on snap dome panel (item 19). Always replace items 12 & 20 when replacing item 19, and always replace item 19 when replacing item 12.

* Replace both top and bottom panels to ensure a match

‡No longer required, may be removed.

†Included with noise suppression kit, see page 7-90

**Not present on all units

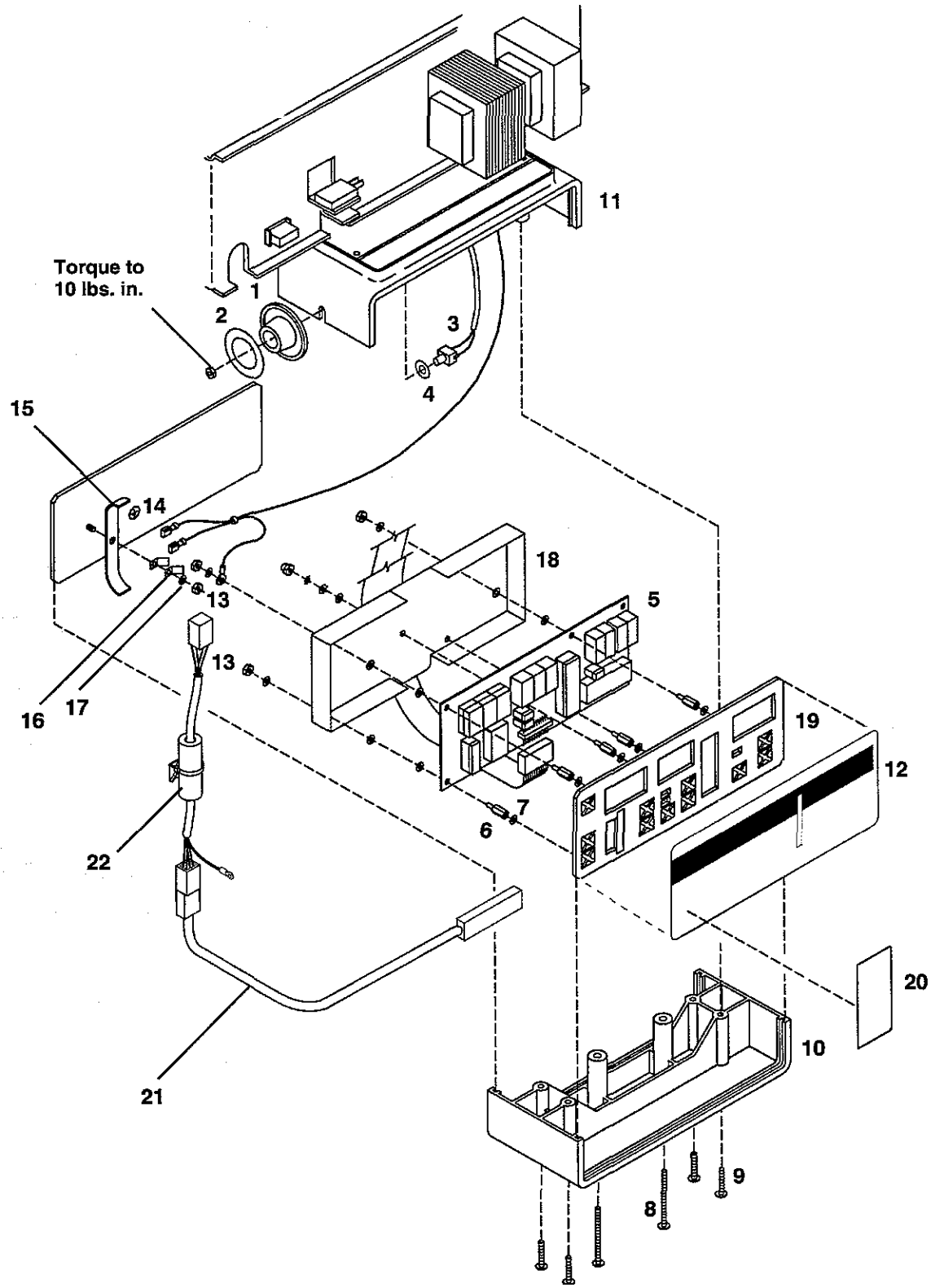


Figure 7-2
Infant Warmer Controller Assembly 2 (All models)

7.3 Infant Warmer Controller Assembly-3 (2001, 3000, 3300, 35000 w/o HCA)

	Description	Stock Number
1.	Lock Nut 8-32 w/Ext Lock Washer	0202-1131-300
2.	Wire tie push mount	6600-0262-600
3.	External Lock Washer	6600-0379-400
4.	Screw, 8-32 x 1/2	6600-0390-400
5.	Transformer 95,115, 220, 240 Vac Input 8 to 13 Vac Output	0208-7580-300
6.	Transformer 95,115, 220, 240 Vac Input 12 Vac Output	0208-7581-300
7.	Hex nut 4-40	0144-3217-113
8.	Internal #4 Lock Washer	0144-1104-131
9.	Mounting Plate	0214-2275-711
10.	Micro Switch (1 amp)	0208-5163 300
11.	Screw, 4-40 x 5/8	6600-0381-400
12.	External #6 Lock Washer	0202-3200-300
13.	Screw, 6-32 x 1/2	6600-0259-400
14.	Screw #6 x 5/8	0142-2833-210
15.	Display Box Mounting Bracket	0214-1571-500
16.	Flat washer	0202-4518-340
17.	Control Board ESD Shield†*	6600-0509-500

†Included with noise suppression kit , see page 7-80

* Not present on all units.

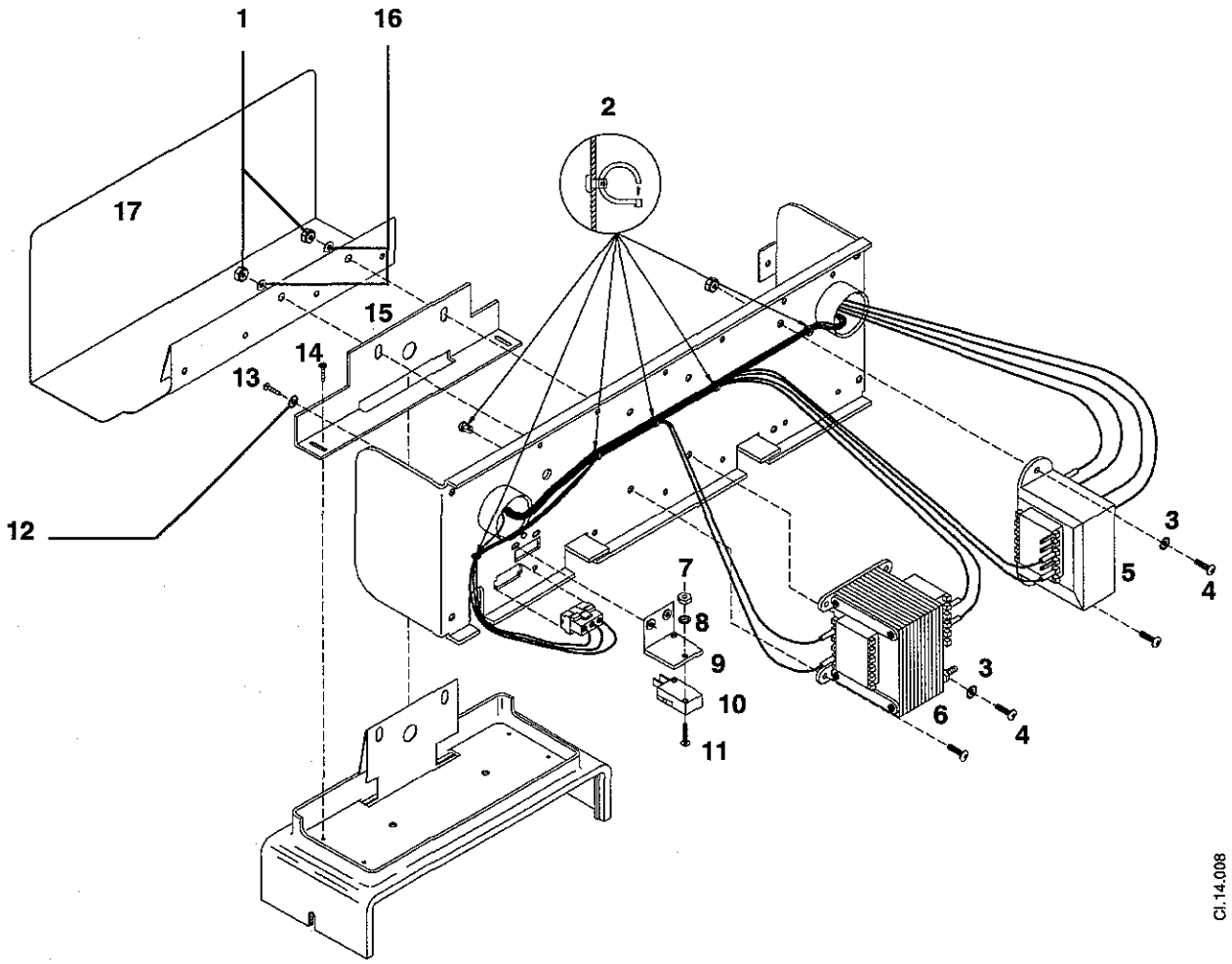
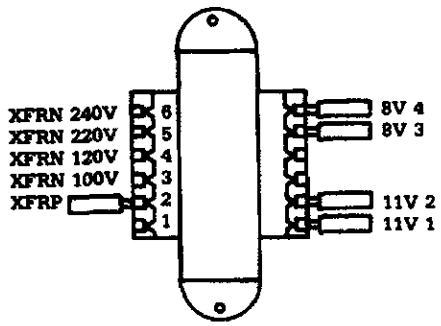
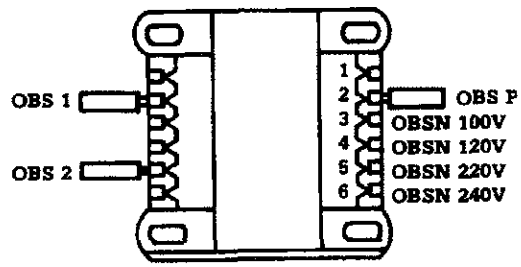


Figure 7-3
Infant Warmer Controller Assembly 3 Series 3000, and 2001 with serial numbers that begin with HAK,HAJ or AAN

7.4 Infant Warmer Controller Assembly-4 (5000 and all Models with HCA)



For 100 V Version, connect to 2 & 3
For 120 V Version, connect to 2 & 4
For 220 V Version, connect to 2 & 5
For 230 V Version, connect to 2 & 6
For 240 V Version, connect to 2 & 6



For 100 V Version, connect to 2 & 3
For 120 V Version, connect to 2 & 4
For 220 V Version, connect to 2 & 5
For 230 V Version, connect to 2 & 6
For 240 V Version, connect to 2 & 6

CI.05.036

	Description	Stock Number
1.	Lock Nut 8-32 w/Ext Lock Washer	0202-1131-300
2.	Wire tie push mount	6600-0262-600
3.	External Lock Washer	6600-0379-400
4.	Screw, 8-32 x 1/2	6600-0390-400
5.	Transformer 95, 115, 220, 230, 240 Vac Input 8 to 13 Vac Output	0208-7580-300
6.	Transformer 95, 115, 220, 230, 240 Vac Input 12 Vac Output	0208-7581-300
7.	Hex Nut 4-40	0144-3217-113
8.	Internal #4 Lock Washer	0144-1104-131
9.	Mounting Plate	0214-2275-711
10.	Micro Switch (1 amp)	0208-5163-300
11.	Screw, 4-40 x 5/8	6600-0381-400
12.	External #6 Lock Washer	6600-0259-400
13.	Screw, 6-32 x 1/2	0140-6124-108
14.	Screw #6 x 5/8	0142-2833-210
15.	Display Box Mounting Bracket	0214-1571-500
16.	Solid State Relay	6600-0457-800
17.	Flat washer	0202-4518-340
18.	Control Board ESD Shield†*	6600-0509-500

† Included with noise suppression kit, see page 7-84

* Not present on all units.

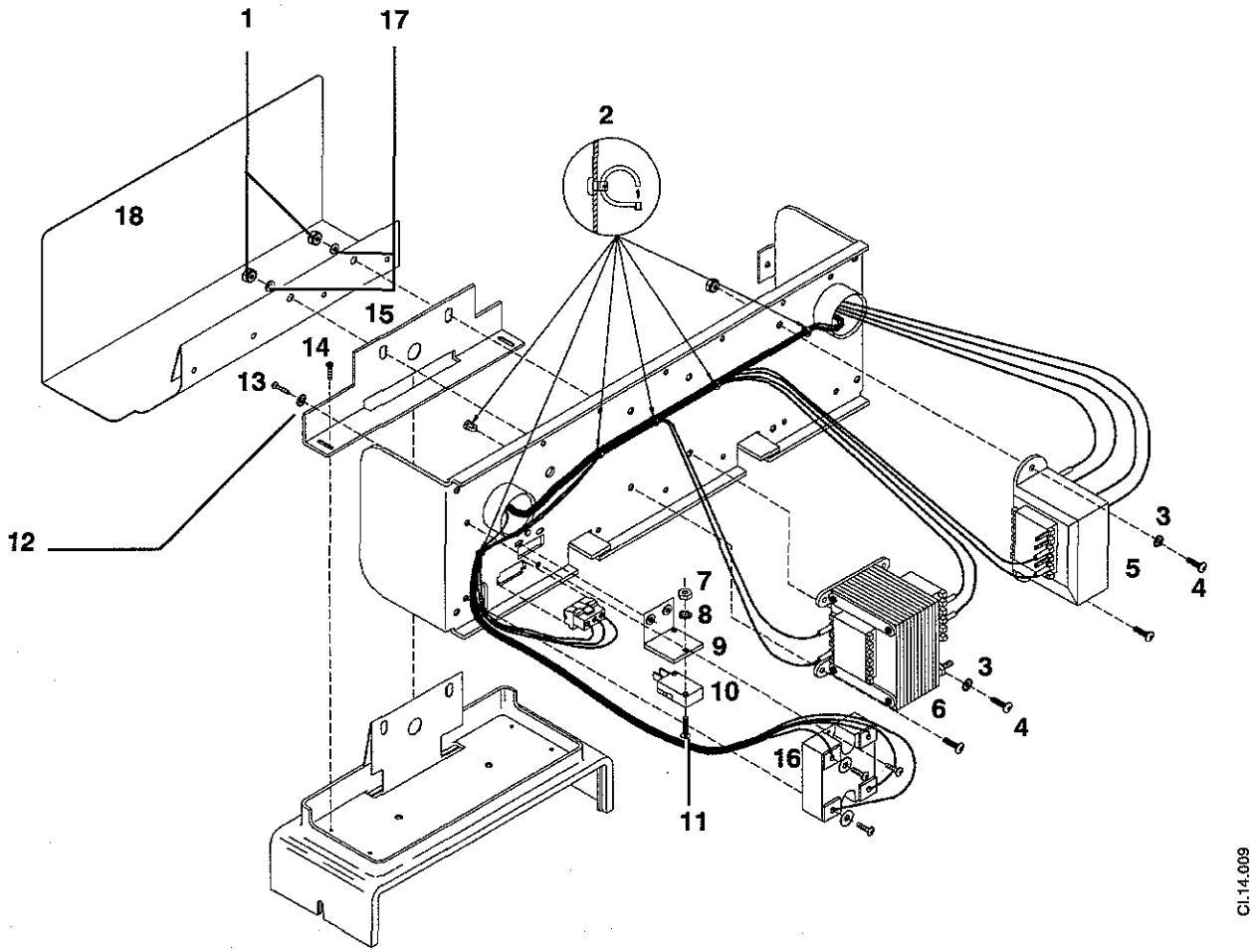
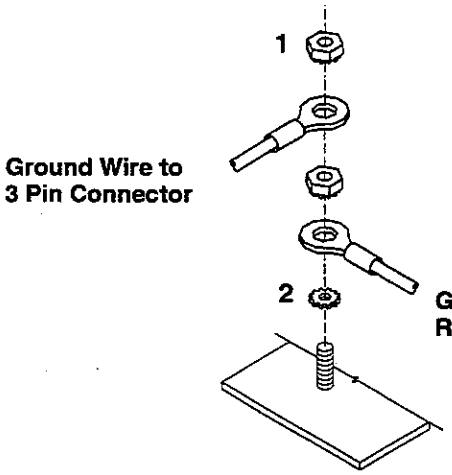


Figure 7-4
Infant Warmer Controller Assembly 4
Model 5000 and all models with HCA or HCC serial numbers

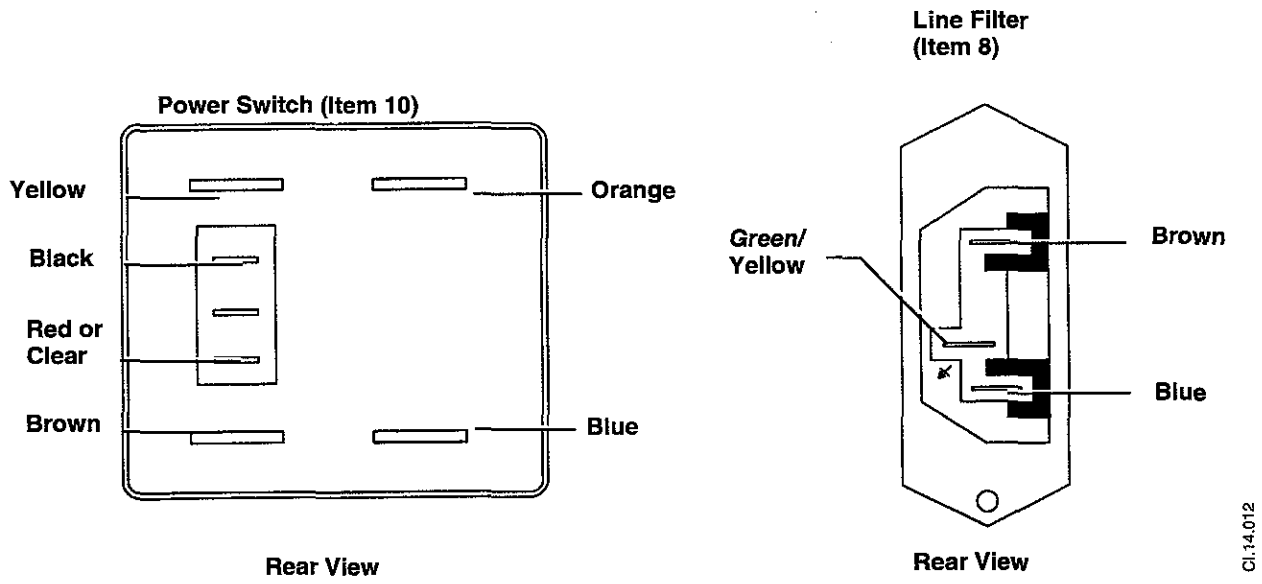
7.5 Infant Warmer Controller Assembly-5 (All Models)



	Description	Stock Number
1.	Lock Washer 8-32 w/Ext Lock Washer	0202-1131-300
2.	External Lock Washer	6600-0379-400
3.	Screw, 6-32 x 1/2*	0140-6124-108
4.	External #6 Lock Washer*	6600-0259-400
5.	Snap Split Bushing	6600-0383-400
6.	Lock Nut #6-32	6600-0382-400
7.	Screw 8-32 x .5	0140-6627-108
8.	Power Cord Line Filter (install from inside)	6600-0170-600
9.	Nylon Grommet	0211-1472-300
10.	Toggle Switch dpst/circuit breaker	0690-2500-365
11.	Controller Wire Harness	
	Model 2001 & Series 3000 with AAN, HAJ and HAK serial number	0208-6181-700
	Model 5000 with AAN serial number	6600-0006-700
	All models with HCA and HCC serial number	6600-0333-700
12.	Cable Assy, 16 Conductor	6600-0211-700
13.	Cable Assy, 12 Conductor	6600-0261-600
14.	Control Board (for units with ESD shielding in place)†	6600-0101-850
15.	Power Supply Board	
	Model 2001 & Series 3000 with AAN, HAJ and HAK serial number	6600-0180-700
	Model 5000 100/120 V with AAN serial number	6600-0182-700
	Model 5000 220/230/240 V with AAN serial number	6600-0184-700
	All models with HCA or HCC serial number	6600-0012-850
16.	Spacer 1/4" Hex 6-32 x 3/4	0402-0234-300
17.	Spacer 1/4" Hex 6-32 x 2	0402-0236-300
18.	Screw #4 x 5/16	6600-0013-400
19.	Control Board ESD Shield†*	6600-0509-500
20.	Standoff, 6-32 x 3/4, Nylon	6600-0479-400
21.	Battery	0690-1000-310
22.	Lockwasher, #6 ext tooth	6600-0259-400
23.	Screw, 6-32 x 3/8 RD, PH	0140-6124-106

†If your unit has no shielding see page 7-90 for a complete noise suppression kit.

* Not present on all units.



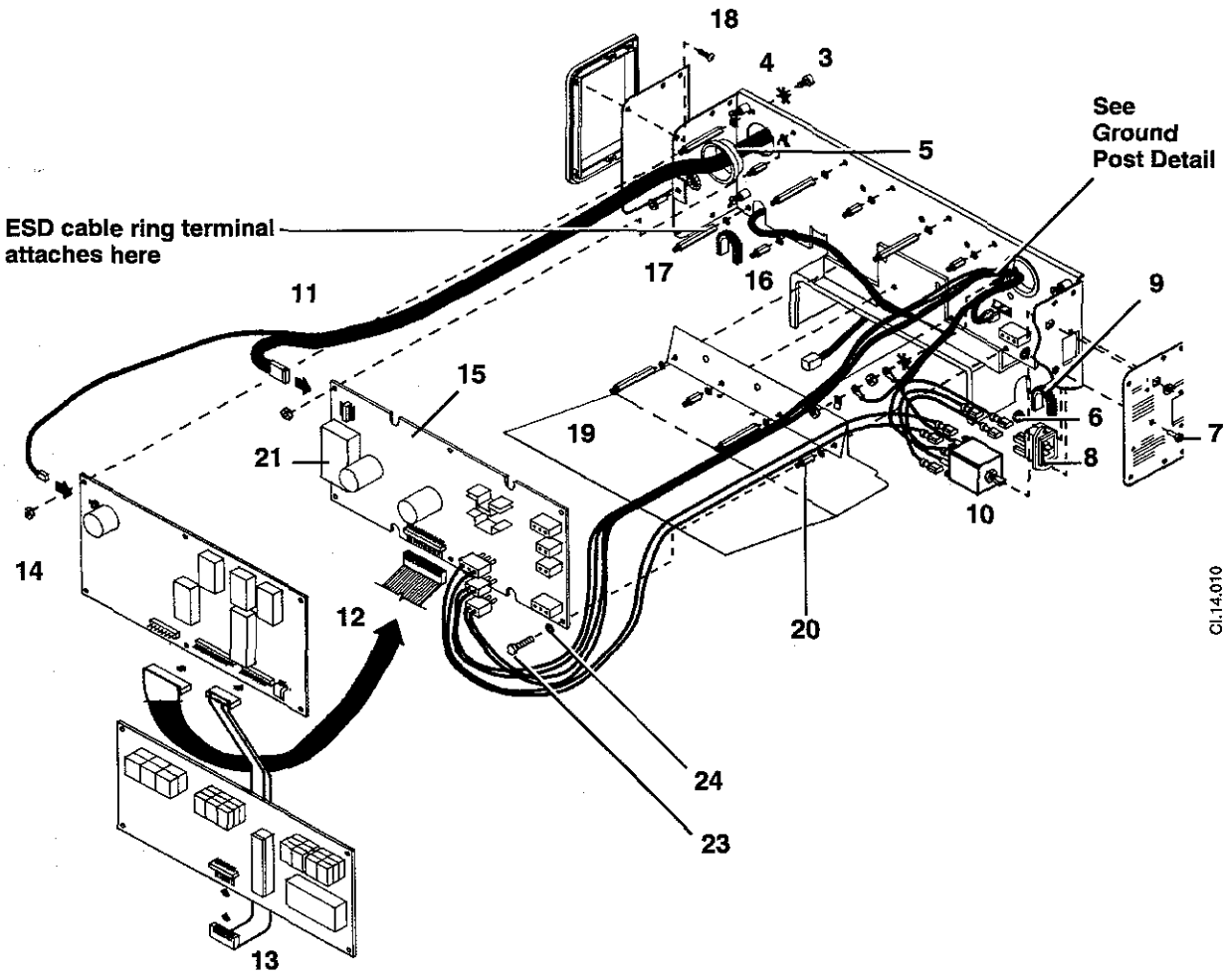


Figure 7-5
Infant Warmer Controller Assembly 5 (All models)

7.6 ThermaLink Option Assembly

	Description	Stock Number
1.	ThermaLink ribbon cable assembly	6600-0346-700
2.	ThermaLink chassis	6600-0550-500
3.	ThermaLink board*	6600-0074-850
4.	Controller label	6600-1931-101
5.	"D" channel (beige)	0217-5320-100
	"D" channel (light grey)	6600-0803-501
6.	ThermaLink wire harness assembly (only fits board without test switch)	6600-0530-700
7.	ThermaLink chassis cover	6600-0551-500
8.	Lock washer, #4 int	0202-3407-300
9.	Screw, 4-40 x 1/4 Phillips	6600-0125-400
10.	Screw, 6-32 x 1/4 PH SST	0140-6624-104
11.	Lock washer, #6 int	0202-3412-300
12.	Screw, #8- 32 x 9/16	0140-6627-109
13.	Lock washer, #8 int	6600-0262-400
14.	Retainer clip	6600-0672-400
15.	Screw lock	6600-0763-400

* PC board without test switch on board. To replace boards with on board test switch, order upgrade kit listed below.

ThermaLink upgrade kit (units with 5.0 or higher software only) .. 6600-0001-850

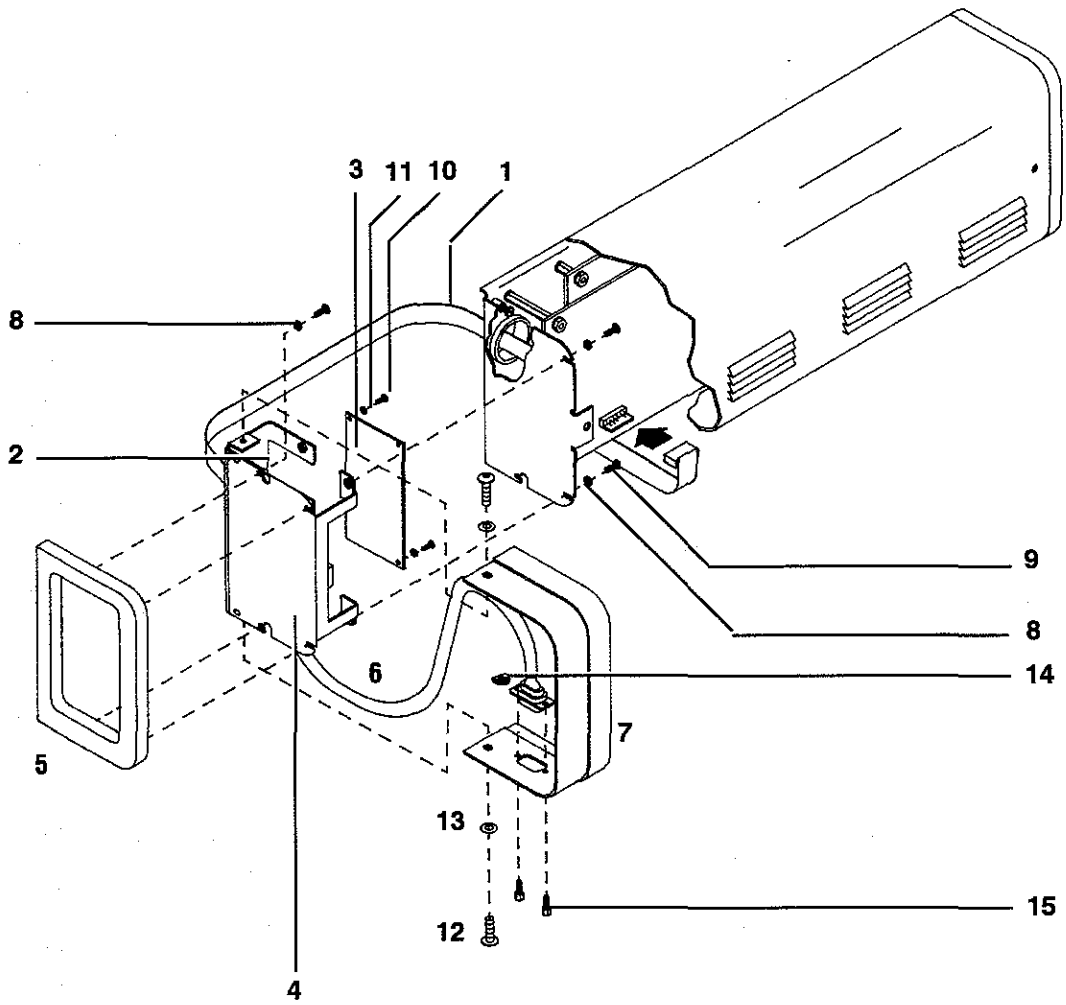


Figure 7-6
ThermaLink option assembly

7.7 Infant Warmer Frame Assembly (3000/3300/4000/4300)

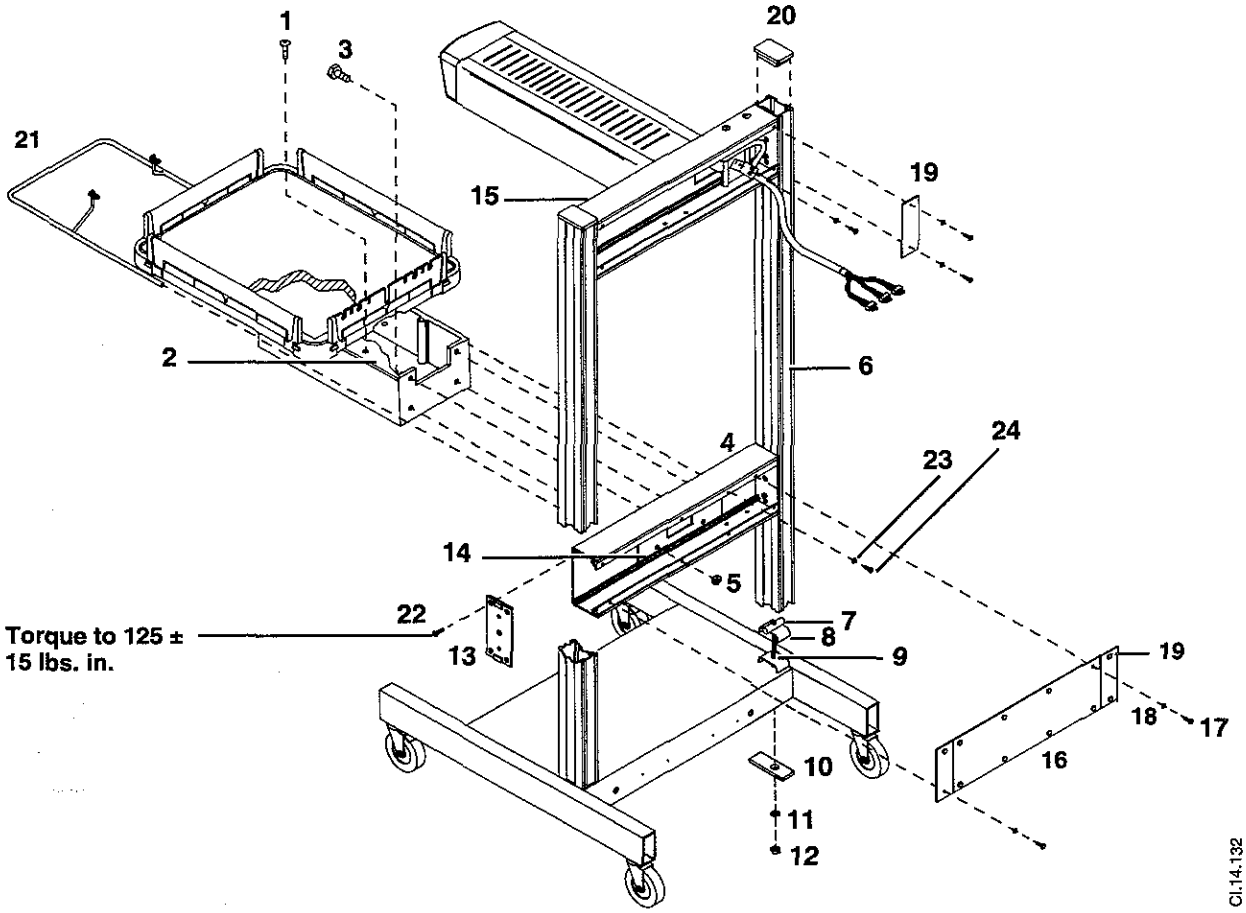
	Description	Stock Number
1.	Screw 10-24 x 5/16	0140-6530-105
2.	Bed support cover (beige)	6600-0805-502
	Bed support cover (light grey)	6600-0805-501
3.	Screw, 3/8-16 x 1-1/4"	6600-0645-400
4.	Lower cross support (3300)	0217-5269-300
	Lower cross support (4300)	6600-0326-400
5.	Nut, elastic 3/8-16	6600-0266-400
6.	Upright with dovetails‡	0217-5266-300
7.	Upright mounting bar	0217-5296-542
8.	Tie-rod centering bracket	0214-1554-500
9.	Upright tie-rod 1/2-13 x 6"	0217-5284-300
10.	Reinforcing plate (used on both cross members)	6600-0233-500
11.	Lock washer 1/2 int	0202-3425-300
12.	Locking nut 1/2-13	6600-0263-400
13.	Locking lug assembly	6600-0339-700
14.	Support plate	0214-1558-511
15.	Upper cross member, beige (model 3000 & 3300)	6600-0341-700
	Upper cross, grey (model 3000 & 3300)@	6600-0341-705
	Upper cross, beige (wall mounted units)	6600-0341-704
	Upper cross member, beige (series 4000)	6600-0341-703
	Upper cross member, grey (series 4000)@	6600-0341-707
	Upper cross, grey (wall mounted units)@	6600-0341-708
16.	Cover, cross member	0214-1550-549
17.	Screw 8-32 x 3/8	6600-0261-400
18.	Lock washer, #8 int	6600-0379-400
19.	Cover*	6600-0450-500
20.	End cap (black)	0217-5286-100
	End cap (grey)	6600-0703-501
21.	Chest drainage hanger	6600-0477-500
	Chest drainage hanger kit (template & hdwr)	6600-0274-800
22.	Screw 1/4 x 1	0142-4247-116
23.	Lock washer, 1/2 x .039 int	0202-3210-340
24.	Screw, 10-24 x 1/2, TRS PH SST†	0140-6630-108
25.	Base spacer plate (Model 4300 only)	6600-0614-500
26.	Support post plate (Model 4300 only)	6600-0612-500
27.	Support post, beige units (Model 4300 only)	6600-0453-400
	Support post, grey unts (Model 4300 only)	6600-0648-400
28.	Support post bracket (Model 4300 only)	6600-0613-500

*Not present on all units

†Use Loctite #24231 (6600-0058-300)

‡ Must order load limit and bed height labels. See label section.

@ Must order label number 6600-1295-xxx. See label section.



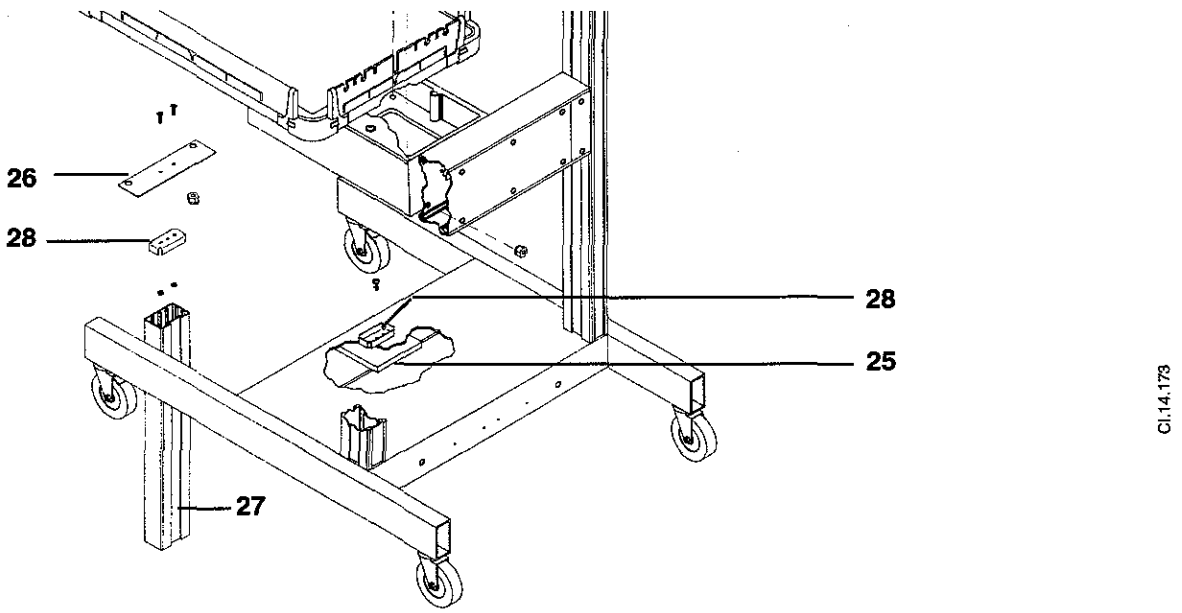
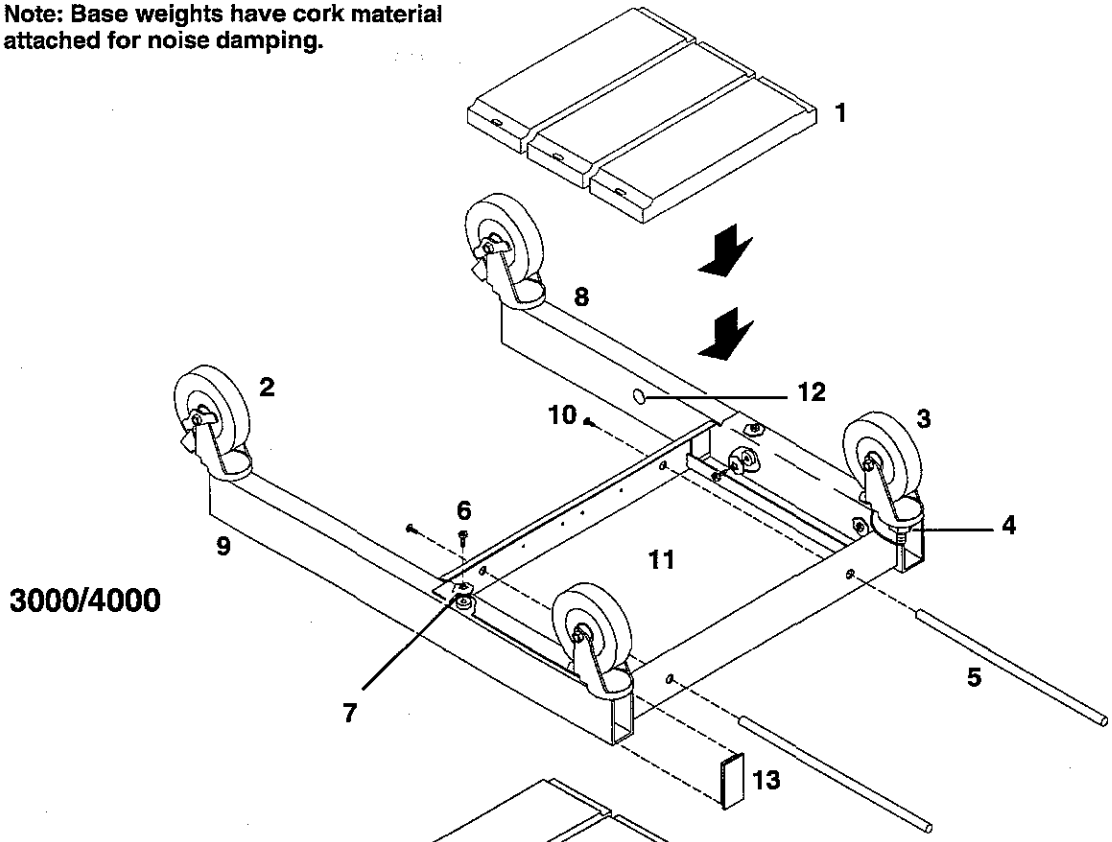


Figure 7-7
Infant Warmer Frame Assembly (Models 3000, 3300, 4000, and 4300)

7.8 Base Assembly (3000/3300/4000/4300)

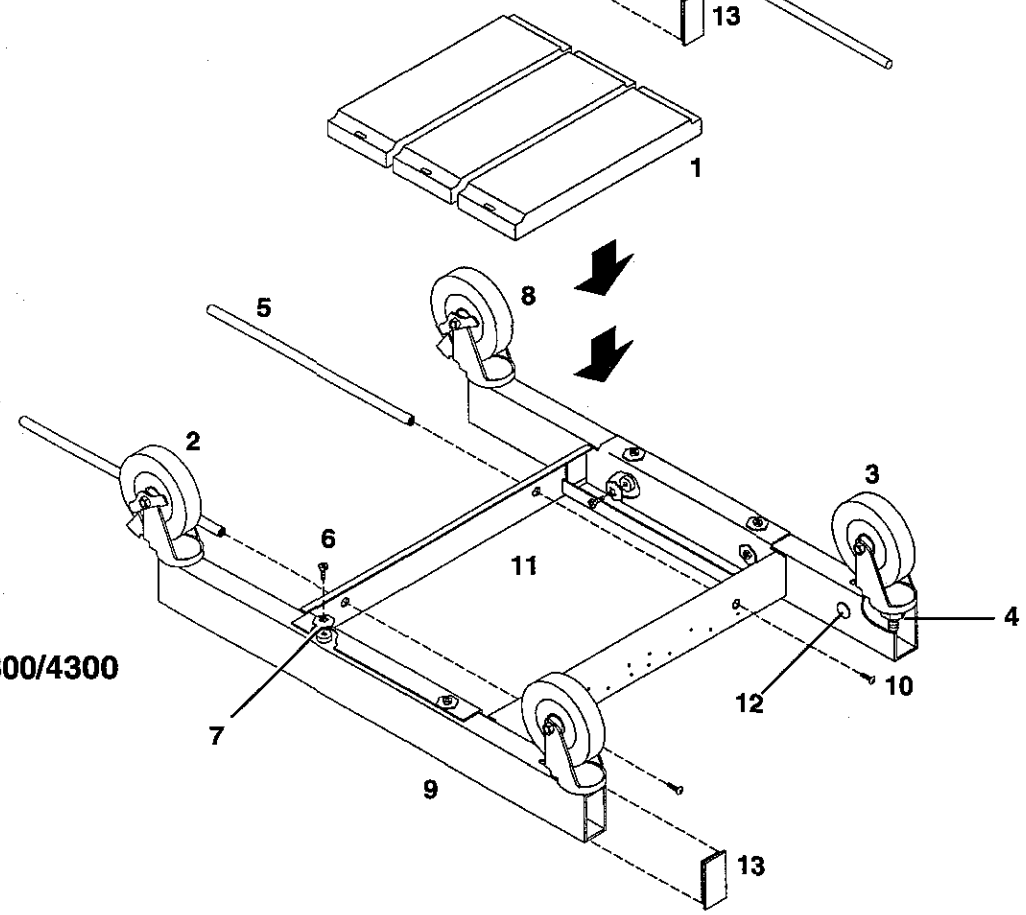
	Description	Stock Number
1.	Cast Iron Base Weight (used on non-elevating models)	0217-5038-100
2.	Locking 5" Caster (black)	0215-8105-300
	Locking 5" Caster (grey)	6600-0569-400
3.	Non-Locking 5 Caster (black)	0215-8104-300
	Non-Locking 5 Caster (grey)	6600-0568-400
4.	Locking Nut	6600-0263-400
5.	Weight Support Rod	0217-5295-542
6.	Screw 5/16-18 x 1	0144-2440-216
7.	Pyramidal Lock washer	0202-3419-300
8.	Right Leg Kit (model 3000)	6600-0245-800
	Right Leg Kit (model 2001/3300)	6600-0250-800
	Right Leg Kit (4000)	6600-0021-850
	Right Leg Kit (3400, 4300 & 4400)	6600-0023-850
9.	Left Leg Kit (model 3000)	6600-0246-800
	Left Leg Kit (model 2001/3300)	6600-0249-800
	Left Leg Kit (4000)	6600-0022-850
	Left Leg Kit (3400, 4300 & 4400)	6600-0024-850
10.	Screw 5/16-18 x 1	0144-2440-216
11.	Base plate, beige (3000/3300)	0214-1553-710
	Base plate, light grey (3000/3300)	6600-0466-701
	Base plate, beige (4000/4300)	6600-0336-700
	Base plate, light grey (4000/4300)	6600-0336-701
12.	Hole Plug	0203-0232-300
13.	End Cap (black)	6600-0520-500
	End Cap (grey)	6600-0520-501

Note: Base weights have cork material attached for noise damping.



3000/4000

Cl.14.016

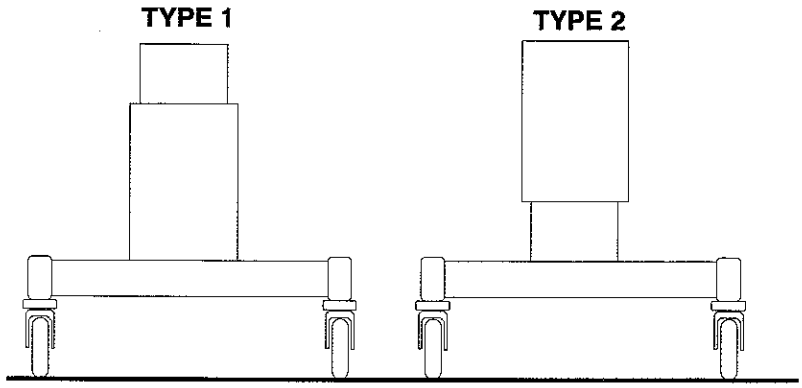


3300/4300

Cl.14.017

Figure 7-8
Base Assembly (Models 3000, 3300, 4000, and 4300)

7.9 Infant Warmer Frame Assembly (3400/4000/5000)



	Description	Stock Number
1.	Screw 10-24 x 5/16	0140-6530-105
2.	Bed support cover (beige)	0214-1559-510
	Bed support cover (grey)	6600-0805-501
3.	Screw, 3/8-16 x 1-1/4	6600-0645-400
4.	Nut, 3/8 - 16, elastic locking	6600-0266-400
5.	Lower cross support (5000)	0217-5180-300
	Lower cross support (4400)	6600-0326-400
	Lower cross support (3400)	0217-5269-300
6.	Nut, elastic 3/8-16	6600-0266-400
7.	Upright with dovetails (5000)	0217-5178-300
	Upright with dovetails (3400 & 4400)	6600-0454-500
8.	End cap (black)	0217-5286-100
	End cap (grey)	6600-0703-501
9.	Screw, 1/4 x 1	0142-4247-116
10.	Support plate	0214-1558-511
11.	Locking lug assembly	6600-0339-700
12.	Leg weight (3400 & 4400 - units without drawers)*	6600-0444-400
13.	Screw 8-32 x 1/2	0140-6627-108
14.	Upper cross assembly (includes cross member, locking lugs and heater hinge assy)	
	(5000) beige	6600-0341-701
	(3400) grey†	6600-0341-705
	(4400) beige	6600-0341-703
	(4400) grey†	6600-0341-707
15.	Cover	0214-1550-549
16.	Screw, 8-32 x 3/8	6600-0261-400
17.	Lock washer, #8	6600-0262-400
18.	Cover, cross member (5000)	6600-0450-501
	Cover, cross member (4400)	6600-0450-500
19.	Chest drainage hanger	6600-0477-500
	Chest drainage hanger kit (template & hdwe)	6600-0274-800
20.	Screw, PH HD 10-24 x 1/2	0140-6630-108
21.	Lock washer, INT	0144-1110-131
22.	Footswitch cable, upright (Type 2 elevating units only)	6600-0480-700

* If drawers are removed, a weight must be installed in the right leg. See Warning on page A-16.

† Order label set when replacing cross assembly. See label section.

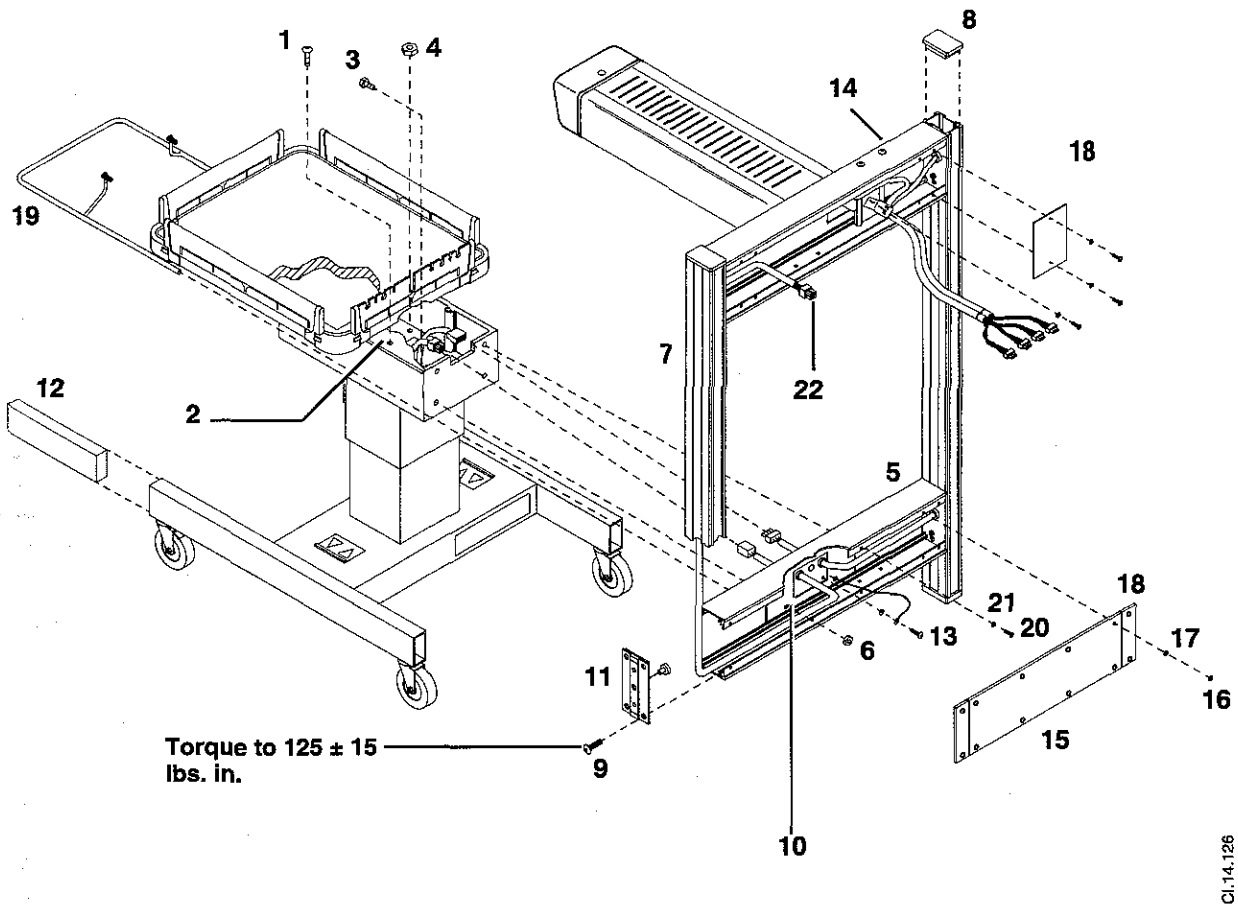
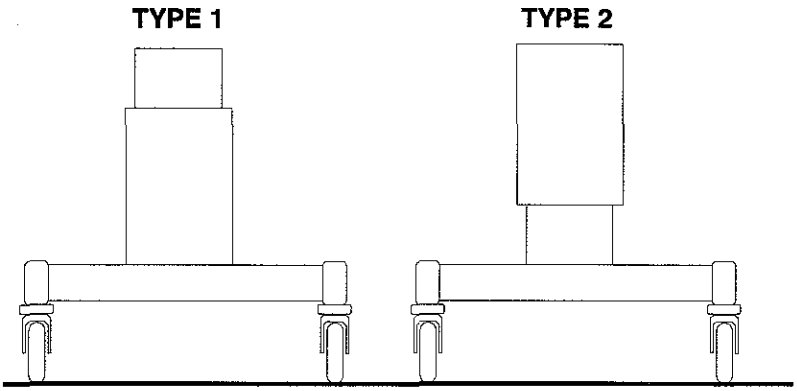


Figure 7-9
Infant Warmer Frame, IWS 3400, 4400 and 5000
(Type 2 unit shown)

7.10 Elevating Base Assembly - (5000/4400)

Type 1 Elevating column parts



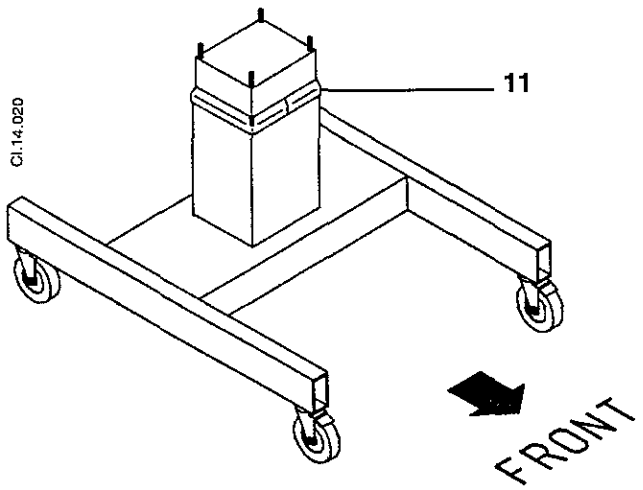
	Description	Stock Number
1.	Locking 5" Caster (black)	0215-8105-300
	Locking 5" Caster (grey)	6600-0569-400
2.	Locking nut	6600-0263-400
3.	Screw 5/16-18 x1	0144-2440-216
4.	Pyramidal lock washer	0202-3419-300
5.	Right leg (5000)	6600-0243-800
	Right leg (4400)	6600-0023-850
6.	Base Subassembly (includes items 13 through 16)*	
	120V (5000)	0217-5185-300
	220/230/240V (5000)	6600-0036-700
	100V (5000)	6600-0038-700
	120V (4400)	6600-0449-500
	220/230/240V (4400)	6600-0449-501
	100V (4400)	6600-0449-502
7.	Hole Plug	0203-0232-300
8	End Cap (5000)	0211-1549-300
	End Cap (4400) black	6600-0520-500
	End Cap (3400 & 4400) grey	6600-0520-501
9.	Non-Locking 5" Caster (black)	0215-8104-300
	Non-Locking 5" Caster (grey)	6600-0568-400
10.	Left leg (5000)	6600-0244-800
	Left leg (4400)	6600-0024-850
11.	Cover, elevating column	6600-0602-500
12.	Screw 5/16-18 x 1 hex	6600-0017-400
13.	Flexible Power Cord	6600-0033-700
14.	Gear/Jackshaft assembly (used in Type 1 and Type 2 units)	0217-5175-300
15.	Capacitor 120V†	6600-0254-800
	Capacitor 220/230/240V†	6600-0255-800
	Capacitor 100V†	6600-0256-800
16.	Motor 115V	0208-2506-300
	Motor 220/230/240V	6600-0037-600
	Motor 100V 50/60 Hz	6600-0217-600

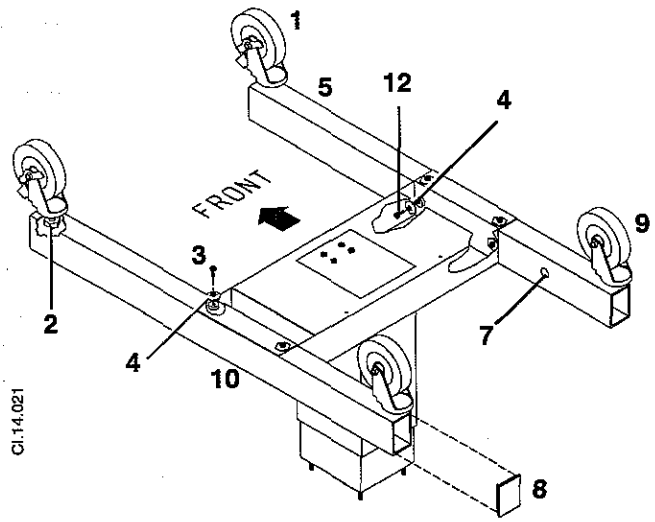
Parts not shown

Bearing replacement kit (Type 1 units - See Appendix)	6600-0069-850
Individual Bearing (8 required)	6600-0747-200

* Must order label set, see label section.

† Kit includes mounting bracket.





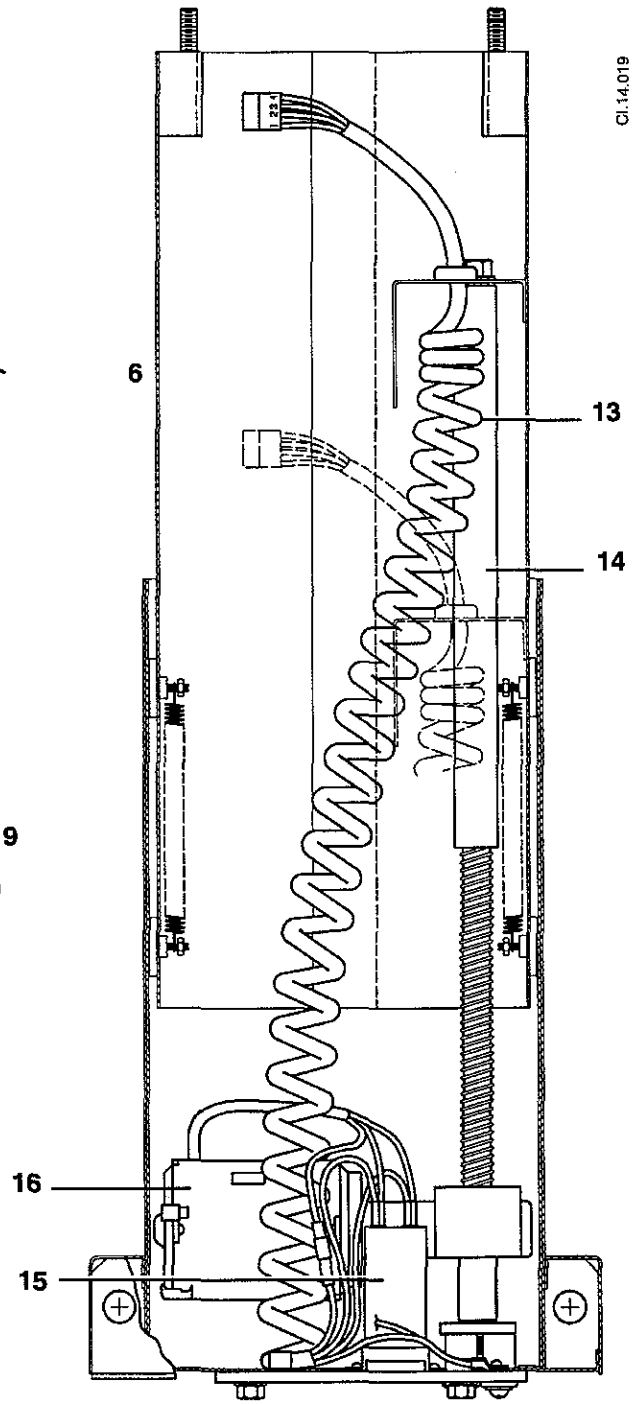
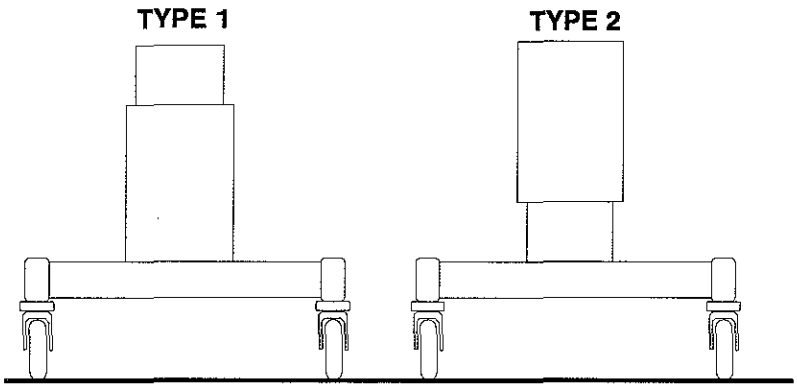


Figure 7-10
Type 1 Elevating Base Assembly, IWS 5000 and 4400

7.11 Column and base hardware-elevating units with footswitches

Type 2 Elevating column parts



	Description	Stock Number
1.	Lock washer, pryamidal 5/16	0202-3419-300
2.	Cap screw 5/16-18 x1	0144-2440-216
3.	Caster, non-locking	6600-0568-400
4.	Nut elastic 1/2-13	6600-0263-400
5.	Caster, locking	6600-0569-400
6.	Screw, 5/16-18 x 1 Hex Hd	6600-0017-400
7.	Lock washer, Int 5/16 x .029	0202-3418-300
8.	Nut, Hex 5/16-18	6600-0071-200
9.	Lock washer, Int #8 .328 OD	0202-3436-300
10	Screw, 8-32 x .38 Trs PH	6600-0261-400
11.	Cover plate	6600-0713-501
12.	End cover plate	6600-0714-501
13.	Nylon clip	6600-0609-400
14.	Nut #10 push-on	6600-0611-400
15.	Spring	6600-0612-400
16.	Slide	6600-0828-500
17.	Bearing, inner column	6600-0750-500
18.	Bushing	6600-0829-500
19.	Screw, 10-24 x 1 Flt Hd Skt	6600-0607-400
20.	Bearing disk	6600-0830-500
21.	Nut, Hex 3/8-16	6600-0610-400
22.	Lock washer 3/8, split ring	6600-0440-400
23.	Outer column, beige	6600-0834-502
	Outer column, grey	6600-0834-501

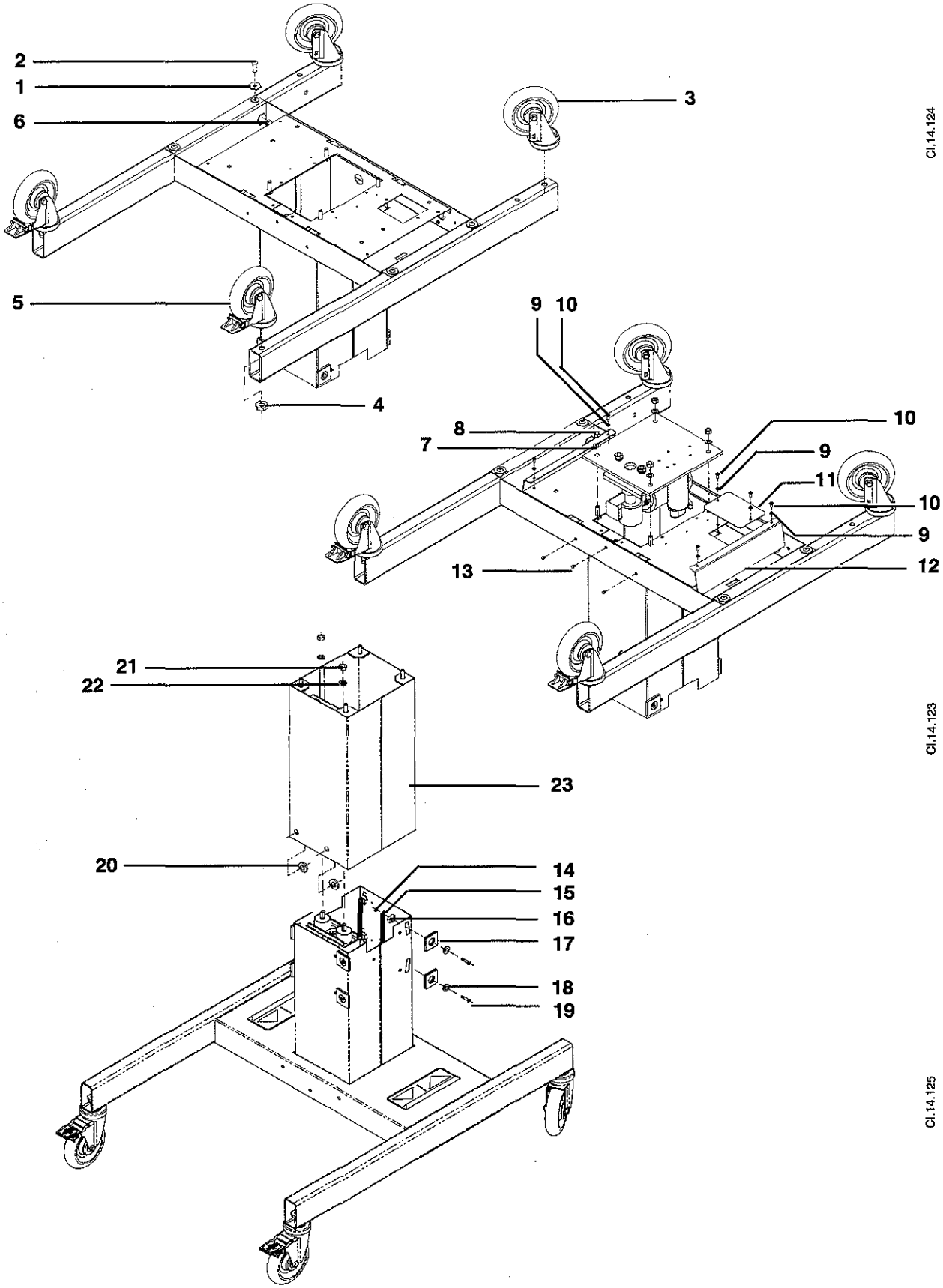
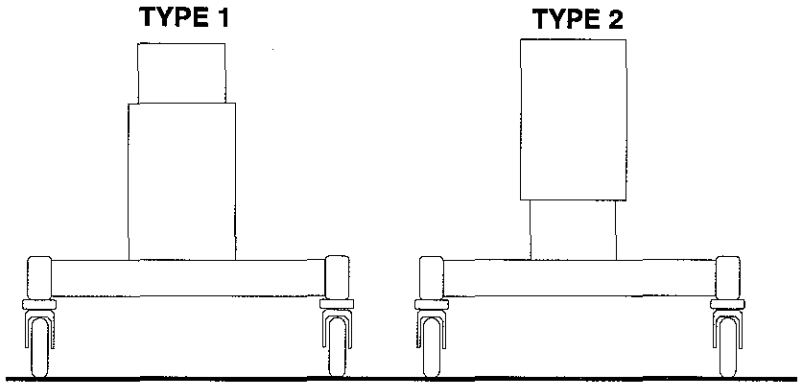


Figure 7-11
Type 2 Column and base hardware-elevating units with and without footswitches

7.12 Inner column footswitch components



	Description	Stock Number
1.	Screw, 5/16 - 18 x 1 Hex	6600-0017-400
2.	Spring lock washer, 5/16	6600-0608-400
3.	Compression mount	6600-0565-400
4.	Mounting plate	6600-0748-500
5.	Actuator column	6600-0294-400
6.	Motor, 115V	6600-0465-600
	Motor, 220-240V	6600-0466-600
	Motor, 100V 50/60 Hz	6600-0464-600
7.	Spacer	6600-0710-500
8.	Screw, 5/16 -18 x 2 Hex	6600-0556-400
9.	Rubber boot	6600-0836-500
10.	Capacitor 120V 40 MFD	6600-0480-600
	Capacitor 220-240V 10 MFD*	6600-0479-600
	Capacitor 100V 45 MFD	6600-0481-600
11.	Nut, 8 -32 Keps	0202-1131-300
12.	Cable clamp	6600-0631-400
13.	Mounting ring	6600-0334-400
14.	Lock washer, 3/8 split ring	6600-0440-400
15.	Nut, 3/8 -16 Hex	6600-0610-400
16.	Actuator mounting plate	6600-0749-500
17.	Coiled cord assembly	6600-0033-700
18.	Strain relief bushing	6600-0558-400
19.	Column cable	6600-0481-700
20.	Cable clamp 3/16"	6600-0051-600
21.	Nut, keps 3-32 x .34	0202-1131-300
22.	Footswitch guide bar	6600-0843-500
23.	Ground label	0205-4737-300
24.	Connector retainer	6600-0572-600
25.	Footswitch kit (includes footswitch and 2 of item 24)	6600-0061-850
26.	Nameplate Label	6600-2004-100

* On some 220-240V elevating IWS units an alternate motor run capacitor has been installed at the factory. This capacitor has an oval shape, rather than the round shape capacitor shown. When replacing the oval shape capacitor, a round mounting bracket (item 13) and hardware (3 of item 11) will be required to accommodate the round shape capacitor.

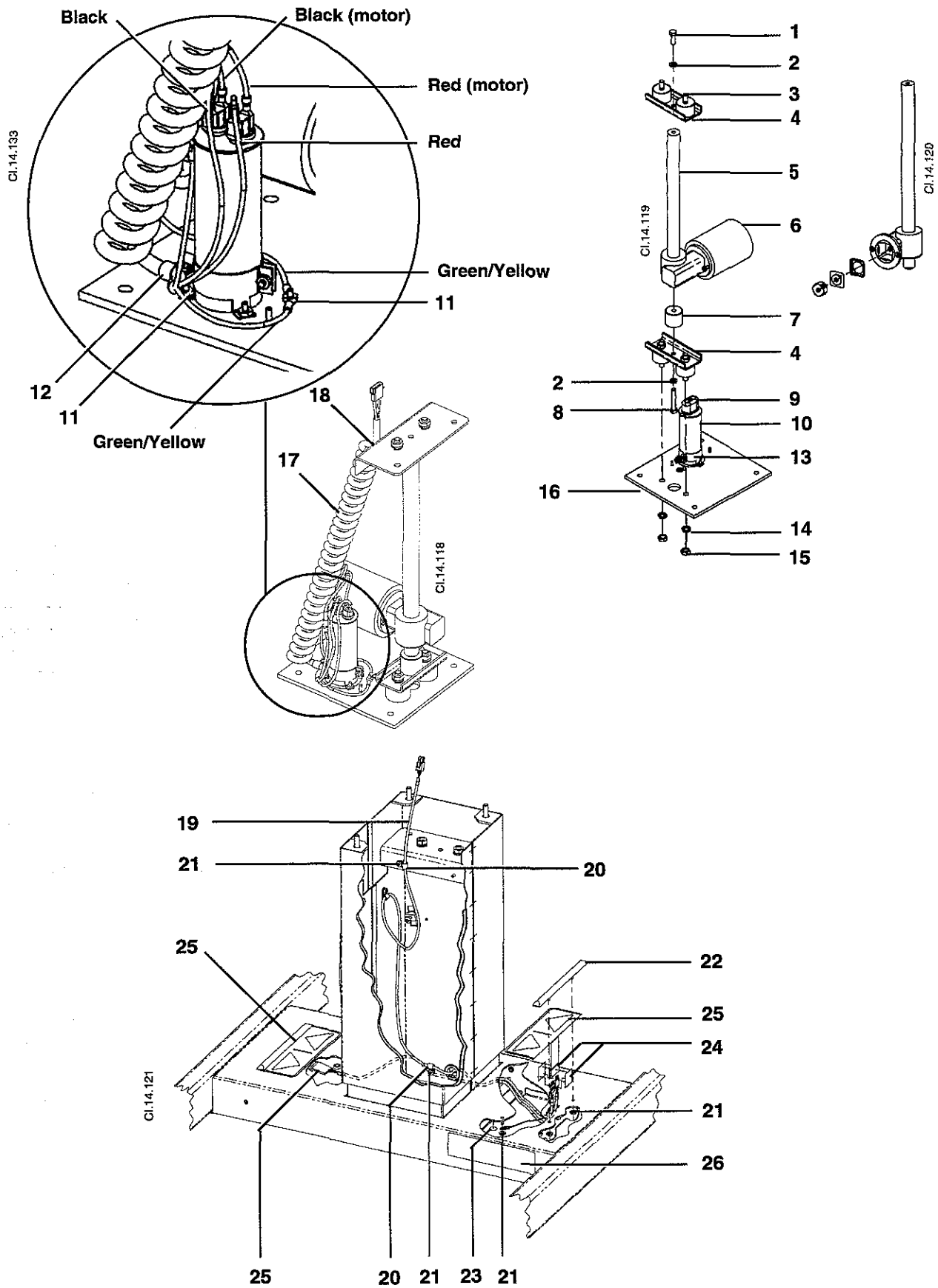


Figure 7-12
Type 2 Inner column footswitch components

7.13 Model 3500 frame assembly

	Description	Stock Number
1.	3500 Upper cross member assy. (beige)	6600-0341-702
	3500 Upper cross member assy. (light grey)	6600-0341-705
2.	Screw	0142-1874-510
3.	Cover	0214-1550-549
4.	Lock washer, #8 int	6600-0262-400
5.	Screw, 8-32 x 3/8	6600-0261-400
6.	End cap (black)	6600-0302-500
	End cap (grey)	6600-0703-501
7.	Routing Clip (Pkg 6) - grey	6600-0055-851
8.	Screw, #8-32, 5/8" *	0140-6627-110
9.	Caster, 2.50, with Lock	6600-0184-400
10.	Lock Washer, #8, external	6600-0379-400
11.	Caster, 2.50	6600-0183-400
12.	Base (beige)	6600-0189-400
	Base (light grey)	6600-0189-401
13.	Nut, elastic 1/2 - 13†	6600-0263-400
14.	Washer, .5621 x 1, .25 OD	0202-4138-300
15.	Tierod 1/2 - 13 x6	0217-5284-300
16.	Nut, elastic 5/16 -24^	0202-1017-300
17.	Washer, .344 ID, .875 OD	6600-0290-400
18.	Screw, 5/16 - 24 x 2-3/4	0144-2241-244
19.	Bar upright	6600-0301-500
20.	Dovetail upright	6600-0180-400
21.	Modesty panel (light grey)	6600-0300-501
	Modesty panel (beige)	6600-0300-500
22.	Lower cross, 3500 (beige)	6600-0177-400
	Lower cross, 3500 (light grey)	6600-0177-401

*Torque 35 in lb. ± 5 in. lb.

†Torque 105 in lb. ± 5 in. lb.

^Torque 360 in lb. ± 5 in. lb.

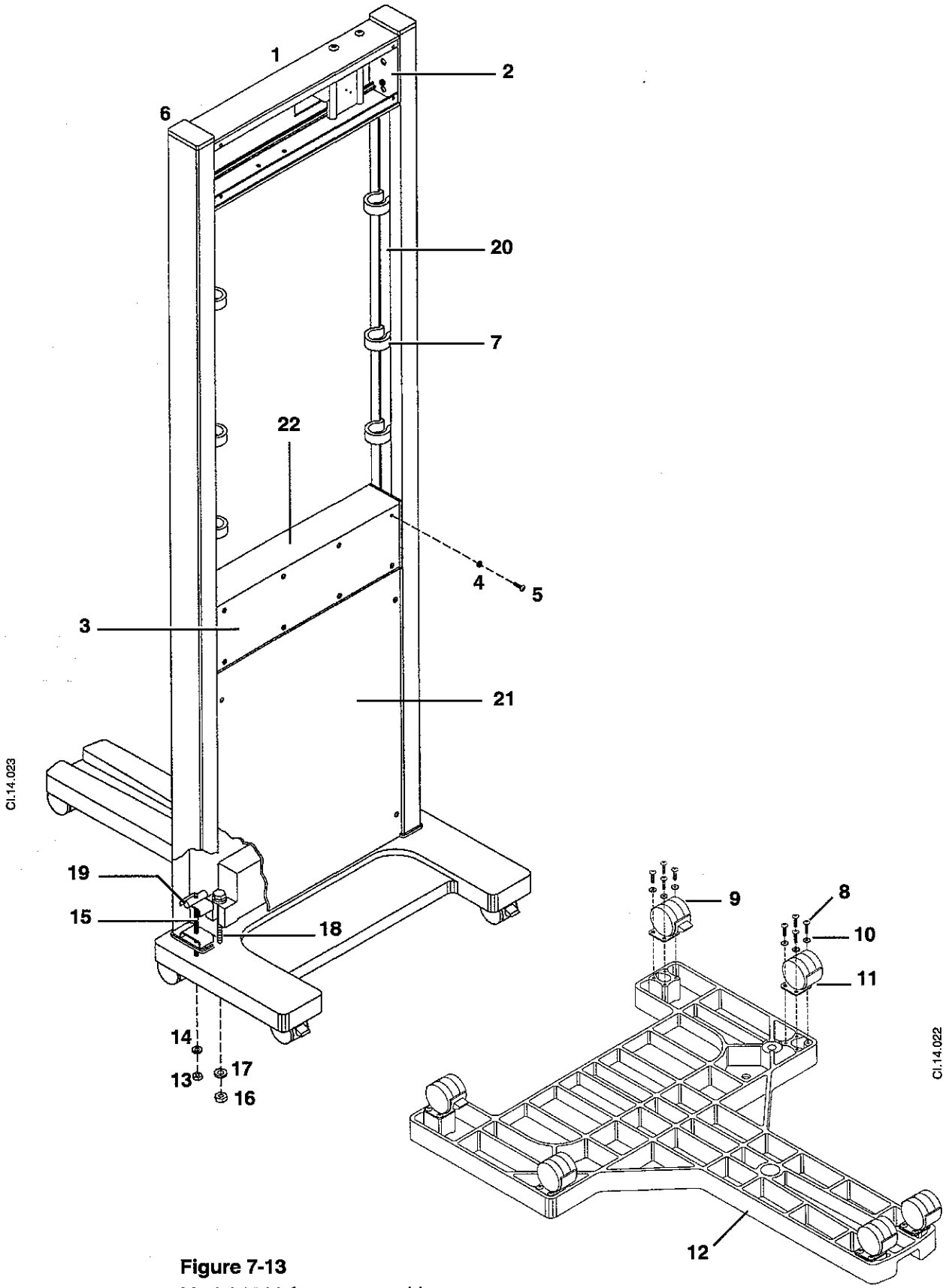


Figure 7-13
Model 3500 frame assembly

7.14 Heater Connections

	Description	Stock Number
1.	Wire Harness, elevating base interconnect	6600-0085-700
2.	Interconnect Wire Harness	
	Units with AAN, HAJ and HAK serial numbers	0208-6179-700
	Units with HCA and HCC serial numbers	6600-0334-700
3.	Cable Tie	0203-5919-300
4.	Interlock Switch Bracket	0214-1570-500
5.	External Lock Washer #8	6600-0379-400
6.	Screw 8-32 x 3/8	6600-0261-400
7.	Lock washer, internal #8	6600-0262-400
8.	Power Cord	
	100/120V 60 Hz	0208-0950-300
	240 V 50 Hz (Australian)	6600-0574-604
	220/230/240V 50/60 Hz	6600-0574-602
9.	Bracket, plug guard	6600-0572-500
10.	Controller cover (Model 2001, Series 3000 and Series 4000)*	0214-1564-549
	Controller cover (Model 5000)†	0214-2273-549
11.	Screw 8-32 x .50	0140-6627-108

*Order label 0205-4958-300 when replacing cover.

†Order label 6600-1988-101 when replacing cover.

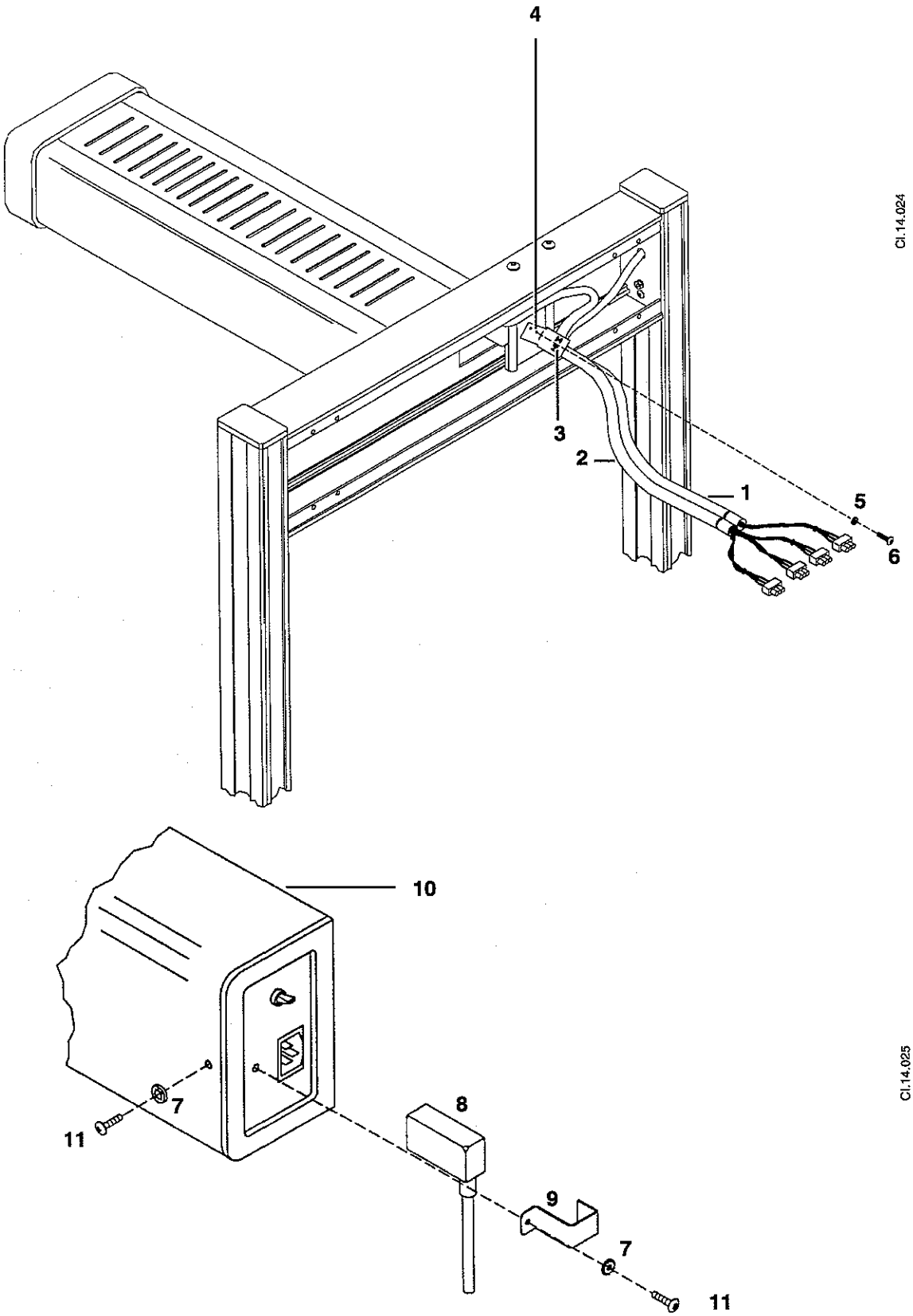


Figure 7-14
Heater Connections

7.15 Heater Assembly

	Description	Stock Number
1.	Screw 6-32 x 3/8	0400-1093-300
2	Screw 6-32 x 1-l/8	6600-0214-400
3.	Alarm Lens	0217-5305-100
4.	Incandescent Lamp 120V	0690-2100-315
5.	Front End Cap (beige) units with HAK, HAJ, AAN & HCA serial number	0217-5303-100
6.	Warmer Module Side	
	Model 2001, 3000, 3300 (beige)	0217-5304-510
	Model 2001 and series 3000, (light grey)	6600-0835-501
	Model 3500 (beige)	6600-0179-400
	Model 3500 (light grey)	6600-0179-401
	Model 5000,4000,4300,4400 (beige)	0217-5181-510
	Model 5000, 4000, 4300, 4400 (light grey)	6600-0797-501
7.	Rear End Cap (beige)	0217-5319-210
	Rear End Cap (light grey)	6600-0815-501
8.	Screw 1/4-20 Hex Head	0142-9277-132
9.	Bumper	0211-1657-300
10.	Heater assy. without heater tube holders (does not include heater tube)	
	Model 2001, Series 3000 with HAK,HAJ & AAN serial number	6600-0316-700
	Model 2001, Series 3000 with HCA and HCC serial number	6600-0316-701
	Model 5000 with AAN serial number	6600-0316-706
	Model 5000, Series 4000 with HCA and HCC serial number	6600-0316-702
11.	Ventilation Plate (2001, Series 3000), beige	0214-1556-510
	Ventilation Plate (2001, Series 3000), grey	6600-0804-501
	Ventilation Plate (5000, Series 4000), beige	6600-0030-500
	Ventilation Plate (Series 4000), grey	6600-0030-501
12.	Lock Washer	0202 3415-300
13.	Hinge Pin	0217-5215-500
14.	Screw 1/4.-20 x 3/4	6600-0395-400
15.	Hinge Cover (beige)	6600-0475-500
	Hinge Cover (grey)	6600-0475-501
16.	Screw 8-32 x 3/8	6600-0261-400
17.	Internal Lock Washer #8	6600-0262-400
18.	External Lock Washer #8	6600-0379-400
19.	Bulb Access Cover (beige)	6600-0476-500
	Bulb Access Cover (grey)	6600-0476-501
20.	Ground Label	0205-4737-300
21.	Insert, Wood Trim, Oak, Model 3500 only	6600-0298-500
22.	Instruction Label Plate - Units with HAK, HAJ, AAN & HCA serial number	0214-1568-500
23.	Instruction Label (applied to item 22) Units with HAK, HAJ, AAN & HCA serial number)	
	English	0205-4958-300
	French	6600-0089-100
	Spanish	6600-0460-100
	German	6600-0470-100
	Italian	6600-1565-100
	Swedish	6600-1567-100
24.	Soft Front End Cap, light grey - Units with HCC serial number	6600-0841-500
	Label, Logo	See label section
25.	Screw, 1/4 -20 x 1 Hex	6600-0630-400
26.	End cap support plate - Units with HCC serial number	6600-0839-500